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Factors affecting the ERP implementation in Indian retail sector

A structural equation modelling approach

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Abstract

Purpose – The purpose of this paper is to make an effort in identifying and exploring the factors which may affect the success of ERP implementation in Indian retail sector. This paper also analyses the between the factors and their impact on the successful implementation of ERP using the structured equation modeling (SEM) approach. "Organizational," "Technological," "People" and "Project Management" are the examined factors.

Design/methodology/approach – A theoretical model is created that explains the factors which may affect the success of ERP implementation. Hypotheses were also developed to evaluate the interrelationship between affecting factors and success of ERP implementation. Empirical data is collected through survey questionnaire from practitioner like project sponsors, project managers, implementation consultants and team members who are involved in ERP implementation in retail sector to test the theoretical model.

Findings – Using SEM, it is found that 62.7 percent of the variations of ERP implementation success can be explained with the help of the model suggested in the research study. The finding also confirms that there is significant positive interrelationship between "Organizational," "Technological," "People," "Project Management" and success of ERP implementation in Indian retail sector.

Research limitations/implications – The research is subject to the normal limitations of survey research. The study is using perceptual data provided by project sponsors, project managers, implementation consultants and team members who are involved in ERP implementation in retail sector, which may not provide clear measures of performance. However, this can be overcome using multiple methods to collect data in future studies.

Practical implications – Findings from this paper can provide greater understanding in the area of ERP implementation. This study will provide valuable insights to researchers, practicing managers and those who are planning to implement ERP in retail sector.

Originality/value – The study integrates the affecting factor with success of ERP implementation, i.e. "Organizational," "Technological," "People" and "Project Management" are the key drivers for the effectiveness and success of ERP implementation in Indian retail sector. Very few studies have been performed to investigate and understand this issue. Therefore, the research can make a useful contribution.

Keywords Enterprise resource planning (ERP), Retail sector, Affecting factors

Paper type Research paper

1. Introduction

ERP can be viewed as a software solution that addresses the enterprise needs taking the process view of the organization, to meet the organizational goals tightly integrating all

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functions of an enterprise. A successfully integrated ERP system can enhance operational efficiency by supporting a firm's business processes as well as create competitive advantages by enabling innovative practices (Al-Mashari *et al.*, 2003).

Retailing in India is one of the business enterprises of its economy and accounts for 14-15 percent of its GDP. The Indian retail market is estimated to be US$450 billion and one of the top five retail markets in the world. India is one of the fastest growing retail markets in the world (ASA & Associates, 2012). Indian retail is expected to grow 25 per cent annually. Modern retail in India could be worth US$175-200 billion by 2016 (Dhanabhakyam and Shanthi, n.d.).

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).

Despite the popularity of ERP, the failure rate of ERP implementation remains high. According to a survey of 117 organizations conducted by the Conference Board, 40 percent of ERP projects failed to meet the business case (Cooke *et al.*, 2001). This result is corroborated by another study done by information technology (IT) management consultancy Robbins-Gioia LLC, which found that 51 percent of companies across a wide range of industries stated that their ERP implementations were unsuccessful (Robbins-Gioia, 2002). Thus, it is critical for executives and managers to fully understand the factor which may affect the success of ERP implementation, so that failure rate of ERP implementation can be reduced.

With this in mind, an exploratory study was undertaken to provide some insight into those factors that will affect the success of ERP implementation. The main goal of this study is to achieve following objectives: to identify the factor which may affect the success of ERP implementation in retail sector and interrelationship between the factor and their impact on the successful implementation of ERP. The paper is organized into seven sections. Section 2 describes a brief review of literature, and highlighting the grouping of factors which may affect the success of ERP implementation. Section 3 presents the conceptual framework and research hypotheses used in the research study. Sections 4 and 5 present the detailed methodology and data analysis and results. The next section presents the Result discussion and recommendations. Conclusion, limitations and further direction of research of research are presented in the last section.

2. Literature review

To assist the understanding of factors affecting of ERP implementation, it is useful to group the previously stated affecting items which may affect the ERP implementation in Indian retail sector. For identifying the grouping of "factor affecting ERP implementation" a pilot study was conducted with a small sample size to understand the possible items which may affect the ERP Implementation in Indian Retail Sector.

For pilot study, we identified the 29 items from the literature. Based on these items, an initial draft questionnaire was developed which contains 29 questions (items). 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".

In the first pilot run, the questionnaire containing 29 items were sent to the seven ERP experts to get external feedback for the content of items and as well as wording of questions and also to verify that the web application operated correctly. 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 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 greater than 0.5 as acceptable (values below this should lead you to either collect more data or rethink which variable to include). SPSS lists "Eigenvalues 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 five items that did not work as a result of the second factor analysis were removed. As a consequence of a thorough study, total eight items were removed from the questionnaire.

Following several iterations of refinement, total 20 items were finalized and these can be grouped into four categories namely "Organizational," "Technological," "People" and "Project Management" which may affect the ERP implementation in Indian retail sector (see Figure 1). For the rest of this paper, these four groups and their related

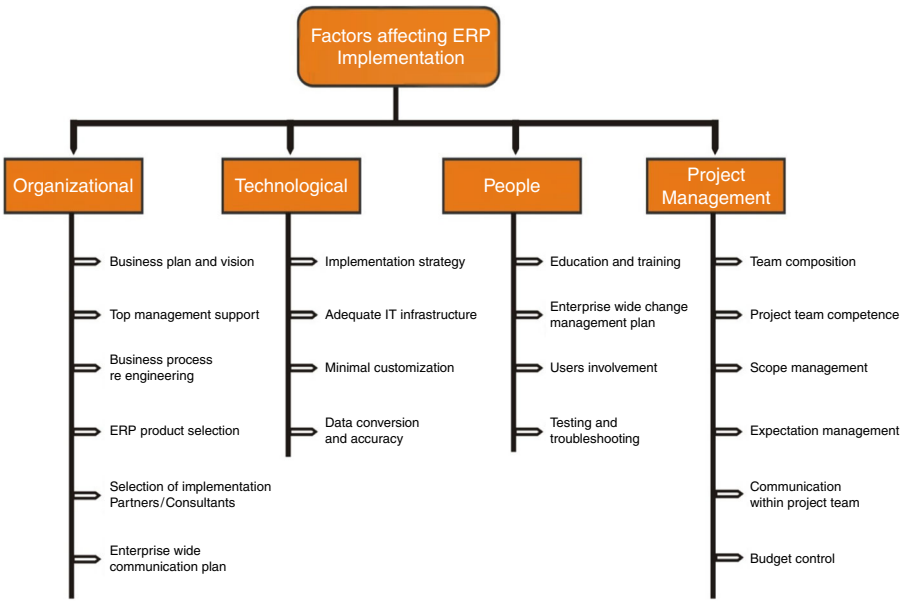

Figure 1.
Tree structure of factors affecting ERP implementation

sub-criteria will be used for further model and hypothesis development, questionnaire and validation. Please note that these criteria are grouped according to output of factor analysis and personal opinions improved by the previous studies, and are subject to change from person to person, according to their point of view.

The first grouping "Organizational" refers to the 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 (Hammer and Champy, 1993; 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.

The second grouping "Technological" refers to the two distinctive implementation strategy of ERP implementation. These strategies 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 infra-structure 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).

The third grouping "People" refers to the 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).

The fourth grouping "Project Management" refers to 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).

3. Conceptual research model and hypotheses

Based on the literatures review, the measurement model and hypothesis are formulated for the exogenous variables and the endogenous variables as shown in Figure 2 to explain the interrelationship between the affecting factor and their impact on the successful implementation of ERP. The research model used in this study consists of four exogenous latent constructs, namely, "Organizational," "Technological," "People" and "Project Management" and endogenous latent construct namely "Success of ERP implementation."

Based on conceptual model the following hypotheses are investigated in the empirical analysis:

H1. Organizational related items are positively affecting the success of ERP implementation.

H2. Technological related items are positively affecting the success of ERP implementation.

H3. People related items are positively affecting the success of ERP implementation.

H4. Project Management related items are positively affecting the success of ERP implementation.

These hypotheses are tested empirically based on data collected from practitioner like project sponsors, project managers, implementation consultants and team members who were involved in ERP implementation in retail sector.

4. Methodology

To test the proposed hypothesis, an online survey was conducted. An online questionnaire was prepared by using facility to make online forms available on Google documents and questionnaire was mailed to project sponsors, project managers, implementation senior consultants and team members who were involved in ERP implementation in retail sector. The experts were asked to respond within two weeks. An auto generated reminder email was sent to the non-respondents two weeks after the questionnaires were emailed. Overall, the questionnaire yielded 290 responses out of which 40 questionnaires were omitted due to incomplete details. Out of 290 questionnaires only 175 questionnaires were used for analysis. The validation of survey instrument was checked through pilot testing and items were finalized after ensuring the reliability and objectivity of the survey.

In the final step, to prove the proposed hypothetical model and model fit, SEM analysis was conducted on AMOS 18.0.

5. Data analysis and results

5.1 Sampling

The targeted population was 300 professionals from IT Companies and retail sector who were involved in ERP implementation in retail sector. The professionals from IT sector and retail sector were selected in this study because they have seen the complete ERP implementation cycle and they know what are main challenges faced by the

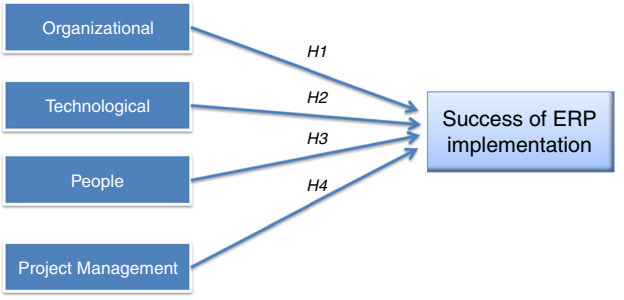

Figure 2.
Research model and hypothesized interrelationships

companies who have undergone the ERP implementation. Out of the 300 questionnaires distributed, 175 (58.3 percent) responses were obtained. The response rate is noticeably high and representative of the population studied. According to Roscoe (1975) for the questionnaire distribution method, in order to avoid sample bias, response rate should be more than 10 percent; and at least of 30 percent responses must be collected for the analysis (Sekaran, 2003). This enables generalization of results obtained (Hussey and Hussey, 1997; Sekaran, 2003).

5.2 The instrument

The questionnaire is divided into five sections to specifically address the four hypotheses formulated in the study. The first section contains four questions capturing the respondents' demographic information such as age, gender, education, designation and company name. The remaining sections comprise of six items on "Organizational" factor (section 2); four items on the "Technological" (Section 3); four items on "People" (Section 4) and six items on "Project Management". All the items in Sections 2-5 were measured using a five-point Likert scale from 1 for strongly disagree to 5 for strongly agree.

5.3 Sample characteristics

Table I exhibits the demographic profile of the respondents. Out of 175 respondents, approximately 33.1 percent of respondents were female and 66.9 percent were male. Majority of respondents (51.4 percent) were in the age group of 25-35 followed by 48.6 percent who were in the age group of 35-45. The survey revealed that 45.7 percent respondents hold MBA degree and 40 percent of them hold BTech/BE degree and rest are graduate in other streams. 5.1 percent of the respondents were project sponsors followed by Project Manager, Implementation Consultant, Team Members and others who were at 18.3, 34.3, 30.9 and 11.4 percent, respectively. According to sample, 95 percent respondents were aware about ERP implementation. It can be inferred from the respondent's profiles that most of the respondents were involved in ERP implementation.

5.4 SEM

SEM is a second-generation multivariate technique that combines multiple regressions with confirmatory factor analysis to estimate simultaneously a series of

Variable	Categories	Response (%)
Gender	Female	33.1
	Male	66.9
Age Group	25-35 years	51.4
	35-45 years	48.6
Education	MBA	45.7
	BTech/BE	40
	Bachelors	14.3
Designation	Project sponsor	5.1
	Project manager	18.3
	Implementation consultant	34.3
	Team members	30.9
	Others	11.4

Table I.
Demographic profile of the sample

interrelationship between the constructs of the hypothesized model. Basically SEM has two components: the measurement model and the structural model. According to Doloi *et al.* (2011), the measurement model is concerned with relationships between latent variables and observed variables, aims to provide reliability and validity based on these variables. The structural model studies path strength and the direction of the relationships among the latent variables. In other words, the measurement model within the structural equation incorporates estimates of measurement errors of the exogenous variables and their intended latent variable (Green, 1990).

The measurement model. A confirmatory factor analysis (CFA) using AMOS 18.0 was conducted to test the measurement model. It is essential to test whether the measurement model has a satisfactory level of validity and reliability before testing for a significant interrelationship in the structural model (Fornell and Larcker, 1981; Ifinedo, 2006). Figure 3 shows a final measurement model of factor affecting the success of ERP implementation. Construct "Organizational," "Technological," "People" and "Project Management" are indicated by six, four, four and six indicators items, respectively, thus four constructs are measured by 20 measured indictor variables (OF1-PMF1).

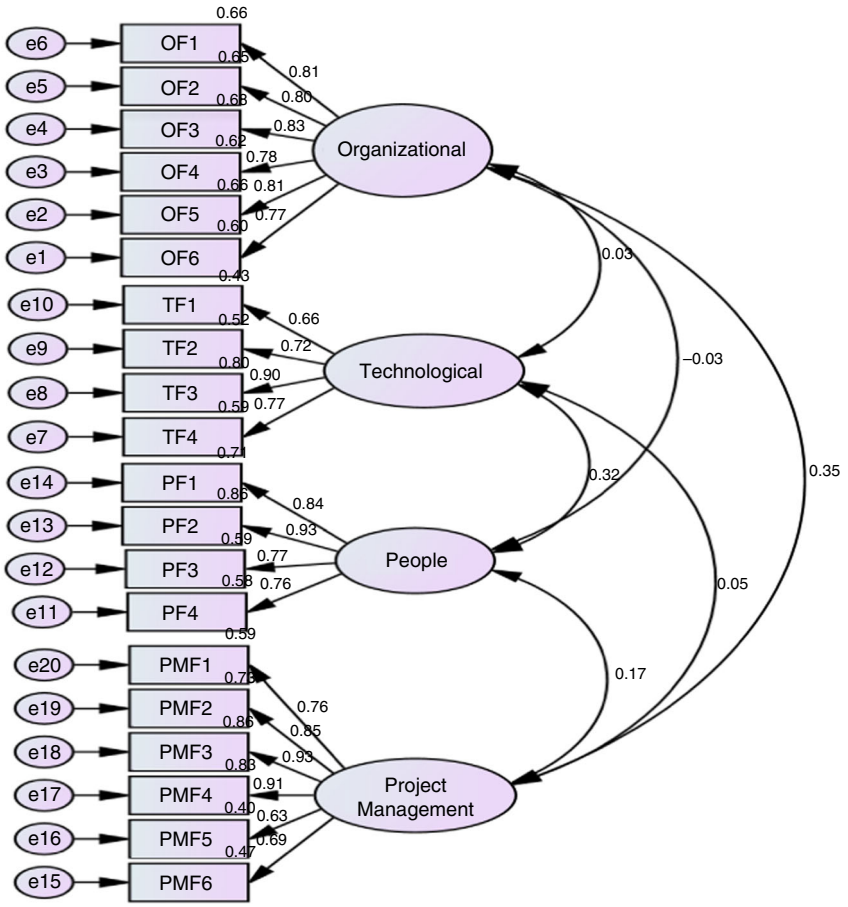

Figure 3.
Measurement model

The psychometric properties of the measurement model in terms of reliability, convergent validity and discriminant validity were evaluated (see Table II).

For reliability determination internal consistency is calculated, which is a measure of reliability of different survey items intended to measure the same characteristics. The indicator used to measure internal consistency is Cronbach's α, a statistics

Construct	Items	Description	Standard factor loading	Cronbach α	Composite reliability	Average variance extracted	Average shared variance
Organizational	OF1	Business plan and vision	0.81	0.911	0.916	0.644	0.041
	OF2	Top management support	0.80				
	OF3	Business process reengineering	0.83				
	OF4	ERP product selection	0.78				
	OF5	Selection of implementation partners /consultants	0.81				
	OF6	Enterprise wide communication plan	0.77				
Technological	TF1	Implementation strategy	0.66	0.833	0.848	0.681	0.034
	TF2	Adequate IT infrastructure	0.72				
	TF3	Minimal customization	0.90				
	TF4	Data Conversion and accuracy	0.77				
People	PF1	Education and training	0.84	0.833	0.895	0.586	0.043
	PF2	Enterprise wide change management plan	0.93				
	PF3	users involvement	0.77				
	PF4	Testing and troubleshooting	0.76				
Project Management	PMF1	Team composition	0.76	0.915	0.914	0.644	0.050
	PMF2	Project team competence	0.85				
	PMF3	Scope Management	0.93				
	PMF4	Expectation management	0.91				
	PMF5	Communication within project team	0.63				
	PMF6	Budget control	0.69				

Table II.
Reliability and items loading

calculated from the pairwise correlation between items which range between 0 and 1. The Cronbach's α score was computed for each constructs ("Organizational," "Technological," "People" and "Project Management") to measure the internal consistency. Table II shows the reliability of each construct was tested through Cronbach's α. A value of 0.6-0.7 for Cronbach's α is considered as a proper degree of reliability, and values above 0.7 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 α for construct "Organizational" is 0.911, for "Technological" is 0.833, for "People" is 0.833, for "Project Management" is 0.915. Thus, these measures are relevant and can be used for SEM analysis.

Composite reliability (CR) is used to measure the reliability of a construct in the measurement model. CR offers a more retrospective approach of overall reliability and estimates consistency of the construct itself including the stability and equivalence of construct (Hair *et al.*, 2010). A value of 0.70 or greater is deemed to be indicative of good scale reliability (Fornell and Larcker, 1981; Nunnally and Bernstein, 1994). Table II shows the composite reliability of "Organizational" is 0.916, "Technological" is 0.848, "People" is 0.895 and "Project Management" is 0.914. So we can conclude that composite reliability of the constructs in measurement model is above 0.70. Therefore, all constructs in the measurement model have good reliability.

Convergent validity shows the extent to which indicators of a specific construct converge or have a high proportion of variance in common (Hair *et al.*, 2010). This validity is measured using standardized factor loadings. The significance of standardized regression weight (standardized factor loading) estimates reveals that the indicator variables are significant and representative of their latent variable. The factor loadings of latent to observed variables should be above 0.50 (Hair *et al.*, 2010). The factor loading of all observed variables in Table II are ranging from 0.63 to 0.93. This clearly indicates that observed variables or items are adequate and corresponded to their constructs. So we can confirms the construct convergent validity.

Discriminant validity shows the extent to which a construct is truly distinct from other constructs (Hair *et al.*, 2010). To assess Discriminant validity, there are two common methods used by most of the researches. First the correlation between measures of theoretically different constructs should not be high, meaning different instrument used to measure different constructs, should not correlate too strongly with instruments of a comparable but distinct characteristics (Trochim, 2006). Second average variances extracted (AVE) of the individual constructs are higher than the shared variances between the constructs and the level of square root of AVE should be greater than the correlations involving the constructs. Figure 3 shows the construct "Organizational" has low positive correlation with "Technological" and "Project Management" (0.03 and 0.35), however, construct "Organizational" has low negative correlation with "People" (−0.03). Similarly "Technological" has low positive correlation with "People" and "Project Management" (0.32 and 0.05). On the same line construct "People" has low positive correlation with "Project Management" (0.17). The low correlation indicates that all the constructs have independent in the measurement model. Additionally the average variances extracted (AVE) of the individual constructs are higher than the shared variances between the constructs (see Table II). And square roots of the AVEs marked in bold (Table III) are greater than the off-diagonal elements in the corresponding rows and columns exceed the correlations between a given

construct; this suggests that a construct is more strongly correlated with its indicators than with the other constructs in the measurement model. So we can state that discriminant validity appears satisfactory at the construct level in the case of all constructs.

The model fit indices like the comparative Fit Index (CFI), the goodness of fit index (GFI), Normed fit index (NFI), Tucker Lewis Index (TLI) and root mean square of error approximation (RMSEA) were selected to judge the model fit (Hair *et al.*, 2010). In order to obtain an acceptable fit with data, the acceptable respective values of χ^2/df, should be less than 3, CFI,GFI, NFI and TLI should be more then 0.9 and the RMSEA value must be lower than 0.08 (Gefen and Straub, 2000). Table IV shows the summary of goodness-of-fit indices for measurement model. The respective χ^2/df, CFI, GFI, NFI and TLI values are 1.642, 0.925, 0.816, 0.831 and 0.913. The RMSEA shows a value of 0.007. Although the GFI and NFI value of 0.813 and 0.816 did not meet the threshold of 0.90, its value was very close to the threshold, thus representing an acceptable model fit.

Table IV clearly demonstrates that measurement model posited a good fit with the collected data so we can further proceed for testing the structural model using SEM.

Structural model. In order to examine the hypothesized conceptual research model, the test of the structural model was performed using SEM. Table V depicts the goodness-of-fit for the model was marginally adequate: χ^2/df, CFI, GFI, NFI and TLI values are 1.518, 0.927, 0.784, 0.815 and 0.917. The RMSEA shows a value of 0.069. Although the GFI and NFI value of 0.784 and 0.815 did not meet the threshold of 0.90, its value was very close to the threshold, this we can conclude that the structural model is accepted as per fit indices and we can further continue to analyze the research hypothesis defined in our model.

Table III.
Correlation matrix and roots of AVE's

	Organizational	Technological	People	Project Management
Organizational	*0.803*			
Technological	0.032	*0.765*		
People	−0.033	0.315	*0.825*	
Project management	0.346	0.049	0.167	*0.803*

Note: [a]Diagonal in italics represents square root of average variance extracted from observed variables (items); off-diagonal represents correlations between constructs

Table IV.
Summary of goodness-of-fit indices for measurement model

Model Fit Index	χ^2/df	CFI	GFI	NFI	TLI	RMSEA
Model	1.642	0.925	0.816	0.831	0.913	0.007

Table V.
Summary of goodness-of-fit indices for full model

Model Fit Index	χ^2/df	CFI	GFI	NFI	TLI	RMSEA
Model	1.518	0.927	0.784	0.815	0.917	0.069

Properties of the structural model (standardized path coefficients (β), standard error, critical ratio and hypotheses result) are indicated in Table VI. The level of significance (α) is set at 0.05. Table VI also reports the Squared multiple correlation R^2. The R^2 value is used to evaluate the strength of the proposed model. The R^2 was the results of the multivariate test of the structural model show that the model, as a whole, explains 62.7 percent of the variation in ERP implementation success could be explained by the four exogenous latent constructs. Figure 4 depicts the structural model.

Table VI presents the results of hypotheses testing, where each of the beta coefficients explains the relative importance of the affecting factor and success of ERP implementation. All expected relationship is positive in nature. The entire four factors which may affect the success of ERP implementation factors are significant with a different value of the beta coefficients, thus contributing different weights to the variance of success of ERP implementation.

The most significant finding is found in relation to the people factors ($\beta = 0.369$; $p < 0.05$), which has a greatest affect on the success of ERP implementation. Hence (*H3*), which states that people-related items are positively affecting the success of ERP implementation, is supported. Next, there is a support for (*H1*), indicating that "Organizational" related items have a significant effect on the success of ERP implementation ($\beta 1 = 0.341$, $p < 0.05$). *H2* is also supported as "Technological"-related items were the third most significant factor which may affect the success of ERP implementation ($\beta 2 = 0.180$; $p < 0.05$). The results of this research support the suggested hypothesis (*H4*) that there is positive affect of "Project Management"-related items on the success of ERP implementation success ($\beta = 0.274$ $p < 0.05$). The estimates are consistent with expectations, because the relationship is significant ($p < 0.05$) and in the anticipated direction.

6. Result discussion and recommendations

In this study, we tested a model and examined the relationship between the factor affecting and ERP implementation success. The empirical evidence provides strong support for our model and hypotheses proposed at the beginning of this study. This result of study generates the valuable findings for different parties of interest are explained. 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.

(1) The "Organizational" factor in this study is defined by business plan and vision, top management support, business process reengineering, ERP product selection, selection of implementation partner/consultants and enterprise wide communication plan items which may affect the success of ERP implementation in Indian retail sector. The empirical result supports *H1*, which assumes that organizational-related items are positively affecting the ERP implementation.

So it is recommended that before ERP implementation there should be clear definition of vision, goal, and business plan in line with the organizations strategic goal and objective. If organizations do not have a defined vision and business plan in hand then there might be high possibility of ERP implementation failure. The finding of current study is consistent with results of prior studies (Nah *et al.*, 2003; Holland *et al.*, 1999; Rosario, 2000; Wee, 2000; Davenport, 2000; Buckhout *et al.*, 1999; Robert and Willcocks, 2007; Mandal

Table VI.
Summary of testing of hypotheses

			Estimates (β)	Unstandardized Regression weight	SE	CR	p	Squared multiple correlation	Result
Success of ERP implementation	←	Organizational	0.341	0.351	0.087	4.052	***	0.627	supported
	←	Technological	0.336	0.371	0.098	3.767	***		supported
	←	People	0.369	0.445	0.101	4.403	***		supported
	←	PM	0.274	0.418	0.128	3.267	0.001		supported

Notes: β, standardized beta coefficients SE, standard error; CR, critical ratio. $p < 0.05$; ***$p < 0.001$

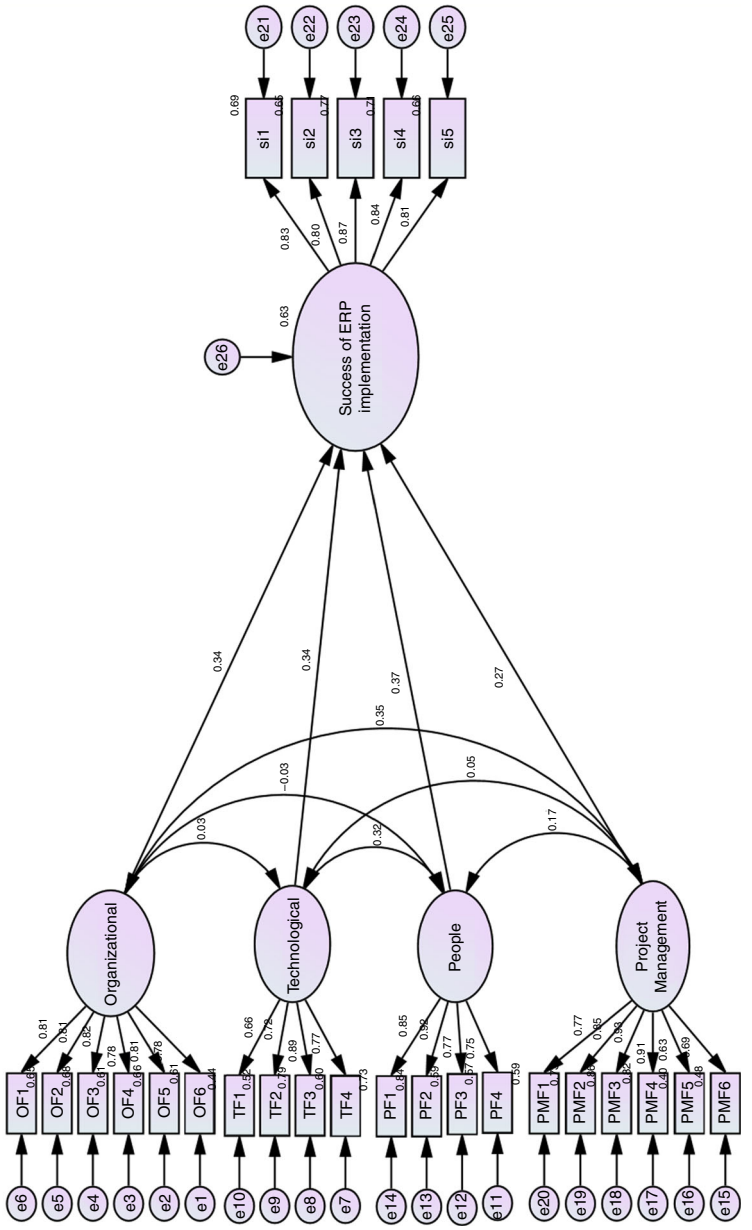

Figure 4.
Structural model

and Gunasekaran, 2003; Somers and Nelson, 2001; Jafari *et al.*, 2006; Ngai *et al.*, 2008; Kumar *et al.*, 2002). Once the business plan and vision is set for the organization, then top management support is recognized as one of the most affecting items for the success of ERP implementation. So it recommended that top management of the retail organization should be highly committed and provide timely and adequate resources for building successful system. This finding is consistent with other study results which confirmed that top management commitment is essential for the success factor of ERP implementation (Aladwani, 2001; Ngai *et al.*, 2008; Holland *et al.*, 1999; Davenport, 2000; Bingi *et al.*, 1999; Buckhout *et al.*, 1999; Robert and Willcocks, 2007; Sumner, 1999; Wee, 2000; Yusuf *et al.*, 2006; Nah *et al.*, 2007; Garg, 2010; Liang *et al.*, 2007; Huang, 2010; Kotter, 1997; Mabert *et al.*, 2003; Laughlin, 1999; Brown and Vessey, 2003; Bhatti, 2005; Keil, 1995; Woo, 2007; Almahdi *et al.*, 2008; Jafari *et al.*, 2006). For achieving the performance improvements in terms of customer service, supply chain and optimizing the operational costs, It is recommended for an Indian retail organization should go for reengineering business processes through ERP implementation. This option offers world best practices to build the effective business process in the organization. Findings are concurred with Hammer and Champy (1993), Somers and Nelson (2001), Holland *et al.* (1999), Roberts and Willcocks (2007), Bingi *et al.* (1999), Rosario (2000), Sumner (1999), Wee (2000), Al-Mashari *et al.* (2006), Nah and Lau (2001), Soh *et al.* (2000), Bajwa *et al.* (2004), Aladwani (2001), Davenport (2000), Wood and Caldas (2001), Singh and Wesson (2009), Markus and Tanis (2000), Ngai *et al.* (2008), Gattiker and Goodhue (2002), Mabert *et al.* (2003), Hein (2008) and Garg (2010). After BPR, selection of the right product for the organizations is the fundamental prerequisite to implement ERP system successfully. Selection of ERP product should be done carefully. While selecting the ERP product for the organizations, mangers should give more focus on functionality of product, product vendor reputation, technology used in the product and after sales support, etc. 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. The finding are consistent with Wei and Wang (2004), Shehab *et al.* (2004), Everdingen *et al.* (2000), Sprott (2000) and Umble and Umble (2002). Selection of implementation partners/consultants is very critical to the success of an ERP implementation because of the complexity of the system. The right implementation partner/consultants helps in achieving the benefits of ERP system quickly, and ensures that your unique business realities are addressed. By contrast, the wrong selection of implementation partner/consultants can result in higher costs and lasting with disruption in business. This result was comparable with other studies (Bingi *et al.*, 1999; Somers and Nelson, 2001; Sumner, 1999; Zhang *et al.*, 2003; Sedera and Dey, 2006; Nah and Lau, 2001; Shanks *et al.*, 2000). Enterprise wide communication plan is one of the most affecting items for ERP implementation success. Poor communications may be the top contributors of the ERP failures. 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 can help in preventing unfounded fears and rumors. Findings are concurred with (Nah *et al.*, 2003; Sarker and Lee, 2003).

(2) The "Technological" factor in this study is defined by Implementation strategy, Adequate IT infrastructure, Minimal customization and Data conversion and accuracy items which may affect the success of ERP implementation in Indian retail sector. The empirical result supports the *H2*, which assumes that "Technological" related items are positively affecting the ERP implementation.

Implementation strategy is one of most affecting item for ERP implementation success. So it is recommended that manager of the retail organizations should clearly define the implementation strategy in advance. 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 focused, 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 finding of this study is consistent with Suganthalakshmi and Mothuvelayuthan (2012), Gibson and Mann (1997), Brown and Vessey (1999), Markus and Tanis (2000), Parr and Shanks (2000), Robey *et al.* (2002), Umble and Umble (2002), Mandal and Gunasekaran (2003), Scott and Vessey (2000), Cliffe (1999), Gupta (2000), Motwani *et al.* (2002), Ngai *et al.* (2008), Holland *et al.* (1999), Kraemmerand *et al.* (2003), Wenrich and Ahmad (2009) and Allen *et al.* (2002). Adequate It Infrastructure is required for running the ERP applications. An ERP system relies in its operation on sophisticated information technology infrastructure. In addition to this IT infrastructure, the software configuration has critical influence on the success of ERP implementation. So it is advisable for Managers to select the adequate infrastructure. The finding are concurred with Jafari *et al.* (2006), Yusuf *et al.* (2006), Kumar *et al.* (2002) and Holland *et al.* (1999). It is also recommended that initially 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 fine, 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. Findings are concurred with Somers and Nelson (2001), Nah and Lau (2001) and Parr and Shanks (2000). 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. The findings are similar to Sum *et al.* (1997),

Markus and Tanis (2000), Xin and Wenjie (2006), Bajwa *et al.* (2004), Somers and Nelson (2001), Yusuf *et al.* (2004), Jha *et al.* (2008), Soh *et al.* (2000) and Umble and Umble (2002).

(3) The "People" factor in this study is defined by Education and training, Enterprise wide change management plan, Users involvement and Testing and troubleshooting items which may affect the success of ERP implementation in Indian retail sector. The empirical result supports *H3*, which assumes that "People" related items are positively affecting the ERP implementation.

It is advisable that all the users must be educated on ERP basics, overview of the system and it's working so that end users can understand what is going to be achieved with the new system. Proper training sessions should be conducted so that all users should understand the functionality of ERP system fullest and will be more comfortable on new ERP system. When the users do not understand what the new system is and what is supposed to do and how to operate it, they will not use it or use it incorrectly. The findings are similar to Sum *et al.* (1997), Jha *et al.* (2008), Heikki *et al.* (2005), Esteves and Casanovas (2003), Kumar *et al.* (2002), Mandal and Gunasekaran (2003), Bingi *et al.* (1999), Aladwani (2001) and Siriginidi (2000). One of the main challenges faced by ERP implementation is resistance to change. About 50 percent ERP projects fail to achieve benefits because managers underestimate the efforts involved in managing change. To successfully implement ERP, the way organizations do business will need to change and the way people do their jobs will need to change too. Thus it is recommended that change management is essential for preparing a company for a Business process management methodology to achieve its goals and its successful implementation. Finding are similar to Ngai *et al.* (2008), Stebel (1992), Nah *et al.* (2007), Siriginidi (2000), Wood and Caldas (2001), Bingi *et al.* (1999), Holland *et al.* (1999), Roberts and Willcocks (2007), Rosario (2000), Stefanou (1999), Sumner (1999), Wee (2000), Shanks *et al.* (2000), Mandal and Gunasekaran (2003) and Aladwani (2001). It is recommended that users should be involved heavily with sense of responsibility in accomplishing the functional requirements definition and testing the system. This will help to take the ownership in their minds and make them accept the ERP System more willingly. The finding are similar to Esteves and Casanovas (2003), Esteves and Pastor (2001), Rosemann *et al.* (2001), Al-Mashari *et al.* (2003) and Hong and Kim (2002). 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. The findings are consistent with Wee (2000), Holland *et al.* (1999), Rosario (2000), Bingi *et al.* (1999), Nah and Lau (2001), Al-Mashari *et al.* (2006) and Yusuf *et al.* (2006).

(4) The Project Management factor in this study is defined by team composition, project team competence, scope management, expectation management, communication within project team and budget control items which may affect the success of ERP implementation in Indian retail sector. The empirical result supports *H4*, which assumes that "Project Management"-related items are positively affecting the success of ERP implementation Indian retail sector. The empirical result supports the hypothesis.

ERP team work and composition is important throughout the ERP implementation. So it is advisable for the manager to select the core competent team which consists of the best people in the organization. And the team should be cross-functional team consisting of mix of consultants and internal staff. Finding are consistent with Buckhout *et al.* (1999), Bingi *et al.* (1999), Rosario (2000), Wee (2000), Sumner (1999), Robert and Willcocks (2007), Stefanou (1999), Somers and Nelson (2004) and Shanks *et al.* (2000). The competence of the project team is another affecting factor for the success of ERP implementations because the more experienced and skilled resource 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. So it advisable that retail organizations must select the competent team. Finding is consistent with Loh and Koh (2004) and Nah *et al.* (2003). Well-defined scope statement is key strategy to success. So it is advisable for the manager to clearly define the scope statement and 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 (UAT). Finding are consistent with Parr and Shanks (2000), Suganthalakshmi and Mothuvelayuthan (2012), Holland *et al.* (1999), Nah *et al.* (2003), Jafari *et al.* (2006), Zhang *et al.* (2005), Ngai *et al.* (2008), Kumar *et al.* (2002) and Rosario (2000). 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. Findings are consistent with Nah *et al.* (2003) and Sarker and Lee (2003). 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. Findings are consistent with Palaniswamy and Frank (2002) and Ribbers and Schoo (2002).

7. Conclusion, limitations and further direction of research

This study has succeeded to examine the factors that affect the success of ERP implementation in Indian retail sector. This paper also analyses the interrelationship between the factor and their impact on the successful implementation of ERP using the SEM approach. 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 affecting factor and ERP implementation success. The research has empirically verified that organizational, technological, people and project management factors are positively affecting the success of ERP implementation. 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 study is using perceptual data provided by like project sponsors, project managers, implementation consultants and team members who were involved in ERP implementation in retail sector, which may not provide clear measures of performance. However, this can be overcome using multiple methods to collect data in future studies.
- 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 affect 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, the model used in this study can be tested by conducting cross-country studies.

References

Akkermans, H. and Helden, K.V. (2002), "Vicious and virtuous cycles in ERP implementation: a case study of interrelations between critical success factors", *European Journal of Information Systems*, Vol. 11 No. 1, pp. 35-46.

Aladwani, A.M. (2001), "Change management strategies for successful implementation", *Business Process Management Journal*, Vol. 7 No. 3, pp. 266-275.

Allen, D., Kern, T. and Havenhand, M. (2002), "ERP critical success factors: an exploration of the contextual factors in public sector institutions", *Proceedings of the 35th Hawaii International Conference on System Sciences*, pp. 3062-3071.

Almahdi, M.S.I., John, M.S. and Aris, A.S. (2008), "A framework for the implementation of ERP to improve business performance: a case study", *European and Mediterranean Conference on Information Systems*, pp. 1-10.

Al-Mashari, M., Al-Mudimigh, A. and Zairi, M. (2003), "Enterprise resource planning: taxonomy of critical factors", *European Journal of Operational Research*, Vol. 146 No. 2, pp. 352-364.

Al-Mashari, M., Ghani, S.K. and Rashid, W. (2006), "A study of the critical success factors of ERP implementation in developing countries", *International Journal of Internet and Enterprise Management*, Vol. 4 No. 1, pp. 68-95.

Al-Mashari, M. (2002), "Enterprise resource planning (ERP) systems: a research agenda", *Industrial Management & Data Systems*, Vol. 102 No. 3, pp. 165-170.

ASA & Associates (2012), "A brief report on retail sector in India August 2012", available at: www.asa.in/pdfs/surveys-reports/Retail-Industry-in-India.pdf

Bajwa, D.S., Garcia, J.E. and Mooney, T. (2004), "An integrative framework for the assimilation of the enterprise resource planning systems: phases, antecedents, and outcome", *Journal of Computer Information Systems*, Vol. 44 No. 3, pp. 81-90.

Baskerville, R., Pawlowski, S. and Mclean, E. (2000), "Enterprise resource planning and organisational knowledge: patterns of convergence and divergence", *Proceedings of the 21st International Conference on Information Systems*, pp. 396-406.

Bhatti, T.R. (2005), "Critical success factors for the implementation of enterprise resource planning (ERP): empirical validation", *Proceedings of The Second International Conference on Innovation in Information Technology (IIT'05)*.

Bingi, P., Sharma, M.K. and Godla, J. (1999), "Critical issues affecting an ERP implementation", *Information Systems Management*, Vol. 16 No. 3, pp. 7-14.

Boudreau, M.C. and Robey, D. (1999), "Organizational transition to enterprise resource planning systems: theoretical choices for process research", *Proceedings of the 20th International Conference on Information Systems*, pp. 291-299.

Brown, C. and Vessey, I. (1999), "ERP implementation approaches: toward a contingency framework", *Proceedings of the International Conference on Information Systems*, pp. 411-416.

Brown, C. and Vessey, I. (2003), "Managing the next wave of enterprise systems: leveraging lessons from ERP", *MIS Quart. Executive*, Vol. 2 No. 1, pp. 65-77.

Buckhout, S., Frey, E. and Nemec, J. Jr (1999), "Making ERP succeed: turning fear into promise", *IEEE Engineering Management Review*, Vol. 27 No. 3, pp. 116-123.

Cliffe, S. (1999), "ERP implementation", *Harvard Business Review*, Vol. 77 No. 1, pp. 16-17.

Cooke, D., Gelman, L. and Peterson, W.J. (2001), "ERP trends", Conference Board, Ottawa, available at: www.conferenceboard.ca/e-library/abstract.aspx?did=869

Davenport, T.H. (2000), *Mission Critical - Realizing the Promise of Enterprise Systems*, Harvard Business School Press, Boston, MA.

Dhanabhakyam, M. and Shanthi, A. (n.d.), "Indian retail industries – its growth, challenges and opportunities", available at: www.fibre2fashion.com/industry-article/free-retail-industry-article/indian-retail-industry-its-growth-challenges-and-opportunities/indian-retail-industry-its-growth-challenges-and-opportunities1.asp

Doloi, H., Iyer, K.C. and Sawhney, A. (2011), "Structural equation model for assessing impacts of contractor's performance on project success", *International Journal of Project Management*, Vol. 29 No. 6, pp. 687-695.

Edwards, J.S. and Panagiotidis, P. (2000), "Organisational learning – a critical systems thinking discipline", *European Journal of Information Systems*, Vol. 10 No. 3, pp. 135-146.

Ehie, I.C. and Madsen, M. (2005), "Identifying critical issues in enterprise resource planning (ERP) implementation", *Computers in Industry*, Vol. 56 No. 6, pp. 545-557.

Esteves, J. and Pastor, J. (2001), "Enterprise resource planning systems research: an annotated bibliography", *Communications of AIS*, Vol. 7 No. 8, pp. 1-51.

Esteves, J.P. and Casanovas, J. (2003), "A goal/question/metric research proposal to monitor user involvement and participation ERP implementation projects", *Proceedings of Information Resources Management Association Conference (IRMA)*, pp. 325-327.

Everdingen, Y., Hillergersberg, J. and Waarts, E. (2000), "ERP adoption by European midsize companies", *Communications of the ACM*, Vol. 43 No. 4, pp. 27-31.

Falkowski, G., Pedigo, P., Smith, B. and Swanson, D. (1998), "A recipe for ERP success", *Proceeding of Beyond Computing*, pp. 44-45.

Field, A. (2005), *Discovering Statistics Using SPSS*, *2nd ed*., Sage. Sandra C. Duhé. University of Lousiana, Lafayette, London.

Fornell, C. and Larcker, D.F. (1981), "Evaluating structural equation models with unobservable variables and measurement error", *Journal of Marketing Research*, Vol. 18 No. 1, pp. 39-50.

Garg, P. (2010), "Critical success factors for enterprise resource planning implementation in Indian retail industry: an exploratory study", *International Journal of Computer Science and Information Security*, Vol. 8 No. 2, pp. 358-363.

Gattiker, T. and Goodhue, D. (2002), "Software-driven changes to business processes: an empirical study of impacts of enterprise resource planning (ERP) systems at the local level", *International Journal of Production Research*, Vol. 40 No. 18, pp. 4799-4814.

Gefen, D. and Straub, D.W. (2000), "The relative importance of perceived ease-of-use in IS adoption: a study of e-commerce adoption", *Journal of the Association for Information Systems*, Vol. 1 No. 8, pp. 1-31.

Gibson, J. and Mann, S. (1997), "A qualitative examination of SAP R/3 implementations in the Western Cape", an empirical research report presented to the department of information systems, University of Cape Town, Cape Town.

Green, P.J. (1990), "On use of the EM for penalized likelihood estimation", *Journal of the Royal Statistical Society, Series B (Methodological)*, Vol. 52 No. 3, pp. 443-452.

Gupta, A. (2000), "Enterprise resource planning: the emerging organizational value systems", *Industrial Management & Data Systems*, Vol. 100 No. 3, pp. 114-118.

Hair, J.F., Black, B., Babin, B., Anderson, R.E. and Tatham, R.L. (2010), *Multivariate Data Analysis: A Global Perspective*, Pearson Education Inc., New Jersey, NJ.

Hammer, M. and Champy, J. (1993), *Reengineering the Corporation: A Manifesto for Business Revolution*, Harper Business, New York, NY.

Heikki, T., Wendy, T.L. and Babaian (2005), "Identifying usability issues with an ERP implementation, 01/2005", *Proceeding of: ICEIS 2005, Proceedings of the Seventh International Conference on Enterprise Information Systems*.

Hein, R.C. (2008), "ERP implementation: a multi-stakeholder analysis of critical success factors", *Proceeding of WICT*, pp. 1-6.

Holland, P., Light, B. and Gibson, N. (1999), "A critical success factors model for enterprise resource planning implementation", *Proceedings of the 7th European Conference on Information Systems*, pp. 273-297.

Hong, K.K. and Kim, Y.G. (2002), "The critical success factors for ERP implementation: an organizational fit perspective", *Information and Management*, Vol. 40 No. 1, pp. 25-40.

Huang, S., Changs, I., Li, S. and Lin, M. (2004), "Assessing risk in ERP projects: identify and prioritize the factors", *Industrial Management & Data Systems*, Vol. 104 No. 8, pp. 681-688.

Huang, Z. (2010), "A compilation research of ERP implementation critical success factors", *Journal of Issues in Information Systems*, Vol. 11 No. 1, pp. 507-512.

Hussey, J. and Hussey, R. (1997), *Business Research: A Practical Guide for Undergraduate and Postgraduate Students*, Macmillan, London.

Ifinedo, P. (2006), "Extending the Gable et al. enterprise systems success measurement model: a preliminary study", *Journal of Information Technology Management*, Vol. 17 No. 1, pp. 14-33.

Jafari, S.M., Osman, M., Yusuff, R. and Tang, S. (2006), "ERP systems implementation in Malaysia: the importance of critical success factors", *International Journal of Engineering and Technology*, Vol. 3 No. 1, pp. 125-131.

Jha, R., Hoda, M.N. and Saini, A.K. (2008), "Implementing best practices in ERP for small & medium enterprises", *IEEE symposium on Advanced Management of information for Globalized Information*, pp. 1-5.

Kaiser, H.F. (1974), "An index of factorial simplicity", *Psychometrika*, Vol. 39 No. 1, pp. 31-36.

Keil, M. (1995), "Pulling the plug: software project management and the problem of project escalation", *MIS Quarterly*, Vol. 19 No. 4, pp. 421-447.

Kim, J.O. and Mueller, C.W. (1978), "An introduction to factor analysis: what it is and how to do it", No. 07-013, Sage University Paper Series on Quantitative Applications in the Social Sciences, Sage, Beverly Hills, CA.

Koch, C. (2001), "BPR and ERP: realising a vision of process with IT", *Business Process Management Journal*, Vol. 7 No. 3, pp. 258-265.

Kotter, J.P. (1997), "What leaders really do", in Vecchio, R.P. (Ed.), *Leadership: Understanding the Dynamics of Power and Influence in Organizations*, University of Notre Dame Press, Notre Dame, IN, pp. 23-34.

Kraemmerand, P., Moller, C. and Boer, H. (2003), "ERP implementation: an integrated process of radical change and continuous learning", *Production Planning & Control*, Vol. 14 No. 4, pp. 338-348.

Kraemmergaard, P. and Rose, J. (2002), "Managerial competences for ERP journeys", *Information Systems Frontiers*, Vol. 4 No. 2, pp. 199-211.

Kumar, V., Maheshwari, B. and Kumar, U. (2002), "ERP systems implementation: best practices in Canadian Government organizations", *Government Information Quarterly*, Vol. 19 No. 2, pp. 147-172.

Laughlin, S.P. (1999), "An ERP game plan", *Journal Business Strategy*, Vol. 20 No. 1, pp. 32-37.

Lee, Z. and Lee, J. (2000), "An ERP implementation case study from a knowledge transfer perspective", *Journal of Information Technology*, Vol. 15 No. 4, pp. 281-288.

Liang, H., Saraf, N., Hu, Q. and Xue, Y. (2007), "Assimilation of enterprise systems: the effect of institutional pressures on the mediating role of top management", *MIS Quarterly*, Vol. 31 No. 1, pp. 59-87.

Loh, T.C. and Koh, S.C. (2004), "Critical elements for a successful enterprise resource planning implementation in small- and medium-sized enterprises", *International Journal of Production Research*, Vol. 42 No. 17, pp. 3433-3455.

McConachie, J. (2001), "The effect of Sub-cultures on the implementation of an enterprise system: an Australian regional university perspective", *Proceedings of the Learning Technologies*, p. 8.

McCredie, J. and Updegrove, D. (1999), "Enterprise system implementations: lessons from the trenches", *CAUSE/EFFECT*, Vol. 22 No. 4, pp. 1-10.

Mabert, V.A., Soni, A.K. and Venkataraman, M.A. (2003), "Enterprise resource planning: managing the implementation process", *European Journal of Operational Research*, Vol. 146 No. 2, pp. 302-314.

Mandal, P. and Gunasekaran, A. (2003), "Issues in implementing ERP: a case study", *European Journal of Operational Research*, Vol. 146 No. 2, pp. 274-283.

Markus, M.L. and Tanis, C. (2000), "The enterprise system experience – from adoption to success", in Zmud, R.W. (Ed.), *Framing the Domains of IT Management: Projecting the Future Through the Past*, Pinnaflex Educational Resources Inc., Cincinnati, OH, pp. 173-207.

Martin, M.H. (1998), "Smart managing", *Fortune Magazine*, Vol. 137 No. 2, pp. 149-151.

Motwani, J., Mirchandani, D., Madan, M. and Gunasekaran, A. (2002), "Successful implementation of ERP projects: evidence from two case studies", *International Journal of Production Economics*, Vol. 75 Nos 1/2, pp. 83-96.

Muscatello, J.R. and Chen, I.J. (2008), "Enterprise resource planning (ERP) implementations: theory and practice", *International Journal of Enterprise Information Systems*, Vol. 4 No. 1, pp. 63-78.

Nah, F. and Lau, J. (2001), "Critical factors for successful implementation of enterprise systems", *Business Process Management Journal*, Vol. 7 No. 3, pp. 285-296.

Nah, F.F.H., Zuckweiler, K.M. and Lau, J.L. (2003), "ERP implementation: chief information officers perceptions of critical success factors", *International Journal of Human-Computer Interaction*, Vol. 16 No. 1, pp. 5-22.

Nah, F.H., Islam, Z. and Tan, M. (2007), "Empirical assessment of factors influencing success of enterprise resource planning implementations", *Journal of Database Management*, Vol. 18 No. 4, pp. 26-50.

Ngai, E.W.T., Law, C.C.H. and Wat, F.K.T. (2008), "Examining the critical success factors in the adoption of enterprise resource planning", *Computers in Industry*, Vol. 59 No. 6, pp. 548-564.

Nunnally, J.C. and Bernstein, I.H. (1994), *Psychometric Theory*, 3rd ed., McGraw-Hill, New York, NY.

O'Leary (2004), "Enterprise resource planning (ERP) systems: an empirical analysis of benefits", *Journal of Emerging Technologies in Accounting*, Vol. 1 No. 1, pp. 63-72.

Palaniswamy, R. and Frank, T.G. (2002), "Oracle ERP and network computing architecture: implementation and performance", *Information Systems Management*, Vol. 19 No. 2, pp. 53-69.

Parr, A. and Shanks, G. (2000), "A model of ERP project implementation", *Journal of Information Technology*, Vol. 15 No. 4, pp. 289-303.

Rao, S. (2000), "Enterprise resource planning: business needs and technologies", *Industrial Management & Data Systems*, Vol. 100 No. 2, pp. 81-88.

Ribbers, P.M.A. and Schoo, K.C. (2002), "Program management and complexity of ERP implementations", *Engineering Management Journal*, Vol. 14 No. 2, pp. 45-52.

Robbins-Gioia (2002), "ERP survey results point to need for higher implementation success", Robbins-Gioia, Alexandria, VA, available at: www.thefreelibrary.com/ERP+Survey+Results+Point+to+Need+For+Higher+Implementation+Success%3B...-a082252573

Robert, P. and Willcocks, L. (2007), "Critical success factors in international ERP implementations: a case research approach", *Journal of Computer Information Systems*, Vol. 47 No. 3, pp. 60-70.

Robey, D., Ross, J.W. and Boudreau, M.-C. (2002), "Learning to implement enterprise systems: an exploratory study of the dialectics of change", *Journal of Management Information Systems*, Vol. 19 No. 1, pp. 17-46.

Rosario, J.G. (2000), "On the leading edge: critical success factors in ERP implementation projects", *Business World, (Philippines)*, Vol. 17, pp. 15-29.

Roscoe, J.T. (1975), *Fundamental Research Statistics for the Behavioural Sciences*, 2nd ed., Holt Rinehart & Winston, New York, NY.

Rosemann, M., Sedera, W. and Gable, G.G. (2001), "Critical success factors of process modelling for enterprise systems", *Proceedings of the Americas Conference of Information Systems (AMCIS '01)*, *Boston, MA*, *August 3-5*.

Sarker, S. and Lee, A.S. (2003), "Using a case study to test the role of three key social enablers in ERP implementation", *Information & Management*, Vol. 40 No. 8, pp. 813-829.

Schwalbe, K. (2000), *Information Technology Project Management*, Course Technology, Cambridge, MA.

Scott, J.E. and Vessey, I. (2000), "Implementing enterprise resource planning systems: the role of learning from failure", *Information Systems Frontiers*, Vol. 2 No. 2, pp. 213-232.

Sedera, D. and Dey, S. (2006), "Multi- stakeholder assessment of critical success factors: insights from the world's fastest SAP R/3 implementation", *Proceedings of the 16th Americas Conference on Information Systems*, pp. 12-15.

Sekaran, U. (2003), *Research Methods for Business A Skill Building Approach*, 4th ed., Wiley and Sons, New York, NY.

Shanks, G., Parr, A., Hu, B., Corbitt, B., Thanasankit, T. and Seddon, P. (2000), "Differences in critical success factors in ERP systems implementation in Australia and China: a cultural analysis", *Proceedings of the 8th European Conference on Information Systems*, pp. 537-544.

Shehab, E.M., Sharp, M.W., Supramaniam, L. and Spedding, T.A. (2004), "Enterprise resource planning: an integrative review", *Business Process Management Journal*, Vol. 10 No. 4, pp. 359-386.

Singh, A. and Wesson, J. (2009), "Evaluation criteria for assessing the usability of ERP systems", *Proceedings of the 2009 Annual Research Conference of the South African Institute of Computer Scientists and Information Technologists*, pp. 87-95.

Siriginidi, S.R. (2000), "Enterprise resource planning in re-engineering business", *Business Process Management Journal*, Vol. 6 No. 5, pp. 376-391.

Slevin, D.P. and Pinto, J.K. (1987), "Balancing strategy and tactics in project implementation", *Sloan Management Review*, Vol. 29 No. 1, pp. 33-41.

Soh, C., Sia, S.K. and Tay-Yap, J. (2000), "Cultural fits and misfits: is ERP a universal", *Communications of ACM*, Vol. 43 No. 4, pp. 47-51.

Somers, T.M. and Nelson, K.G. (2001), "The impact of critical success factors across the stages of enterprise resource planning implementations", *Proceedings of the 34th Hawaii International Conference on System Sciences*, pp. 8016.

Somers, T.M. and Nelson, K.G. (2004), "A taxonomy of players and activities across the project life cycle", *Information & Management*, Vol. 41 No. 3, pp. 257-278.

Sprott, D. (2000), "Componentizing the enterprise application packages", *Communication of the ACM*, Vol. 43 No. 2, pp. 63-69.

Stebel, P. (1992), *Breakpoints: How Managers Exploit Radical Change*, Harvard Business School Press, Boston, MA.

Stefanou, C.J. (1999), "Supply chain management (SCM) and organizational key factors for successful implementation of enterprise resource planning (ERP) systems", *Proceedings of the Americas Conference on Information Systems (AMCIS)*, p. 800.

Suganthalakshmi, T. and Mothuvelayuthan, C. (2012), "Grouping of critical success factors for ERP implementations", *International Journal of Multidisciplinary Research*, Vol. 2 No. 4, pp. 316-323.

Sum, C.C., Ang, J.S.K. and Yeo, L.N. (1997), "Contextual elements of critical success factors in MRP implementation", *Production and Inventory Management Journal*, Vol. 38 No. 3, pp. 77-83.

Sumner, M. (1999), "Critical success factors in enterprise wide information management systems projects", *Proceedings of the Americas Conference on Information Systems (AMCIS)*, pp. 232-234.

Trochim, W.M.K. (2006), "Introduction to validity", Social Research Methods, available at: www.socialresearchmethods.net/kb/introval.php (accessed September 9, 2010).

Umble, E.J. and Umble, M.M. (2002), "Avoiding ERP implementation failure", *Industrial Management*, Vol. 44 No. 1, pp. 25-33.

Verville, J. and Halingten, A. (2003), "A six-stage model of the buying process for ERP software", *Industrial Marketing Management*, Vol. 32 No. 7, pp. 585-594.

Wee, S. (2000), "Juggling toward ERP success: keep key success factors high", ERP News, February, pp 1-5.

Wei, C. and Wang, M. (2004), "A comprehensive framework for selecting an ERP system", *International Journal of Project Management*, Vol. 22 No. 2, pp. 161-169.

Wenrich, K. and Ahmad, N. (2009), "Lessons learned during a decade of ERP experience: a case study", *International Journal of Enterprise Information Systems*, Vol. 5 No. 1, pp. 55-73.

Woo, H. (2007), "Critical success factors for implementing ERP: the case of a Chinese electronics manufacturer", *Journal of Manufacturing Technology Management*, Vol. 18 No. 4, pp. 431-442.

Wood, T. and Caldas, M.P. (2001), "Reductionism and complex thinking during ERP implementations", *Business Process Management Journal*, Vol. 7 No. 5, pp. 387-393.

Xin, J.H. and Wenjie, W. (2006), "Factors affecting adoption of ERP in China", *Proceedings of the International Conference on Computational Intelligence for Modeling Control and Automation and International Conference on Intelligent Agents Web Technologies and International Commerce*p. 156.

Yasser, J. (2000), "ERP implementation and critical success factors, the role and impact of business process management", *Proceedings of The 2000 IEE International Conference on Management of innovation and Technology*, *Singapore*, pp. 167-178.

Yusuf, Y., Gunasekaran, A. and Abthorpe, M.S. (2004), "Enterprise information systems project implementation: a case study of the ERP in Rolls-Royce", *International Journal of Production Economics*, Vol. 87 No. 3, pp. 251-266.

Yusuf, Y., Gunasekaran, A. and Wu, C. (2006), "Implementation of enterprise resource planning in China", *Technovation*, Vol. 26 No. 12, pp. 1324-1336.

Zhang, L., Lee, M.K.O., Zhang, Z. and Banerjee, P. (2003), "Critical success factors of enterprise resource planning systems implementation success in China", *Proceedings of the 36th Hawaii International Conference on System Sciences*, *Hawaii*, pp. 136-143.

Zhang, Z., Lee, M., Huang, P., Zhang, L. and Huang, X. (2005), "A framework of ERP systems implementation success in China: an empirical study", *International Journal of Production Economics*, Vol. 98 No. 1, pp. 56-80.

Further reading

Muijs, D. (2004), *Doing Quantitative Research in Education With SPSS*, Sage Publications Ltd, London.

Ng, C.S.P. (2001), "A decision framework for enterprise resource planning maintenance and upgrade: a client perspective", *J. Softw. Maintenance Evol.: Res. and Practice*, Vol. 13 No. 6, pp. 431-468.

Nunnally, J.C. (1978), *Psychometric Theory*, 2nd ed., McGraw Hill, New York, NY.

Soja, P. (2006), "Success factors in ERP implementation: lessons from practice", *Journal of Enterprise Information*, Vol. 19 No. 4, pp. 418-433.

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