

Impact of People Resources in Enterprise Resource Planning (ERP) Implementation Process on External Environment of an Organization.

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Abstract

ERP has one comprehensive real-time database for reducing data redundancy and integrated business process and seamless transitions between business transactions. ERP integrates inventory data with financial, sales, and human resources data, enabling organizations to price their products, produce financial statements, and manage people, materials, and money better. But, ERP is a driver of comprehensive change, business process improvements, and process orientation which results the performance of the external environment of an organization. This research paper throws light on the impact of the people resources involved during the ERP implementation process on the performance related to the external environment of an organization. Structural Equation Modeling using PLS software was applied for the analysis of data. The study found that User and Consultant Resources used during ERP implementation were associated with the external environment of an organization.

Keywords: People Resources, ERP implementation, external environment etc.

Introduction

Buckhout et al. (1999) define as, "Enterprise systems provide a backbone of information, communication, and control for a company". Esteves and Pastor (2000) states as, "ERP embody the current best business practices for organizational processes". Soh et al. (2000) states, "ERP software packages enable companies to integrate business processes across organizational functions and locations and hence facilitate such management. It enables decision-makers to have an enterprise-wide view of the information they need in a timely, reliable and consistent fashion". ERP systems are enterprise-wide application packages that are designed to provide information systems integrated supports to various business functions such as manufacturing, inventory management, financial and accounting, human resource management (Tarn et al., 2002).

APICS (American Production and Inventory Control Society) (2001), has defined ERP systems as, "A method for the effective planning and controlling of all the resources needed to take, make, ship and account for customer orders in a manufacturing, distribution or service

company". An ERP system provides the enterprise with the capacity to plan and manage its resources based on an integrated approach (Turban et al., 2003). Some authors in IS field like Davenport (1998) and Turban et al. (2003) call them 'enterprise information systems'.

Three elements defining ERP are identified in Akkermans et al. (2003), namely, a technical, a functional, or a business perspective. From the technical and functional perspectives, material requirements planning (MRP), manufacturing resource planning (MRP II), and ERP represent the development of methods and software tools for the planning and controlling of resources for manufacturing companies (Bergström and Stehn, 2005). MRP systems could initially be used for calculating material requirements and handling orders, but were expanded to handle capacity planning and scheduling (Umble et al., 2003). In the business perspective, ERP can be viewed as a business approach integrating strategic and operational functions through the entire organization.

According to ERP Research Group (1997), An ERP system has four main characteristics: First, ERP can be regarded as a multinational system, since it contains the national laws and representative businesses of various countries. Second, reference models in the ERP system embody best business practices; the reference models supposedly reflect the most preferred business models in terms of the data employed and business processes, as well as organizational structures. Third, because ERP integrates all business processes of an organization with one database, all departments throughout the organization can access the same information in real time. Fourth, the parameters of ERP provide room for a firm to be able to customize the system to fulfil its specific circumstances.

The concept of ERP can also be analyzed from different perspectives. As stressed by Klaus et al. (2000), firstly, ERP is like a software product. Secondly, it is a means of mapping multiple processes to generate an integrative and comprehensive structure. He defined ERP as "A comprehensive package of software solutions which seek to integrate the complete range of business processes and functions in order to present a holistic view of the business from a single information and IT architecture".

Rationale

The ultimate objective of any organizational initiative to install ERP system is to reveal some advantage, whether it is

associated with cost savings, improved efficiencies, or better decision-making. ERP systems can provide an organization with many benefits. It is important that these benefits outweigh the costs of the system and they should as long as the correct system for the organization is chosen and the system is implemented properly. Furthermore, both positive and negative aspects of enterprise systems implementation should be considered especially in the areas of economic, technical, organization and social (Soja, 2008). These systems can in the long run save millions of dollars, improve quality of information, and increase workers' productivity by reducing the amount of time to do a job. ERP systems can virtually eliminate the redundancies that occur from outdated and disparate systems that may be present in each department of an organization.

Verville et al. (2005) stressed that ERP software has also some barriers. Soh et al. (2000) pointed out about the problems which are caused by the difference between functionality offered by the package and that required by the firm in ERP projects. While trying to adjust the ERP software and the system in the enterprise, there will be some barriers. Barriers cause firms to experience a decrease in organizational performance instead of realizing improvements (Hirt and Swanson, 2001). Hawking et al. (2004) discussed the role of barriers in limiting the realization of benefits and categorizes barriers as people, process or technology related barriers. Hence, this study was undertaken to understand the role of people related factors in the success of the external environment related to organization.

Literature Review

Critical Success Factors

Rockart (1979) defined critical success factors (CSF) as "the limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organization". In the ERP context, Holland and Light (1999) define them as the factors that are needed to make sure an ERP project is successful. Different researchers have contributed to the following critical success factors of the organization. Cissna (1998) finds that factors relating to top management support, assignment of best people to implementation teams, and strong involvement of people from the field are important in reducing the resistance to changes involved in ERP implementation.

Project team competence	Somers and Nelson, 2001; Ewusi, 1997; Akkermans and Helden, 2002; Saini et al., 2010
Organizational culture	Ein-Dor and Segev, 1978; Thong et al., 1996; Bajwa et al., 1998; Al-Mashari and Zairi, 1999; Stefanou, 1999; Aladwani, 2001; Brown and Vessey, 2003; Krumholz and Maiden, 2001
Lack of application knowledge	Barki et al., 1993; Ewusi, 1997
Lack of analysts with business and technology knowledge	Sumner, 1999, 2000
External expertise	Ein-Dor and Segev, 1978; Thong et al., 1996; Bajwa et al., 1998; Davenport, 2000; Ifinedo, 2006b; Wang and Chen, 2006; Saini et al., 2010
Consultant resources	Holland and Light, 1999; Somers and Nelson, 2001; Bingi et al., 1999; Dewar and Dutton, 1986; Eveland and Tornatzky, 1990; Gable, 1991; Gupta, 2000; Robey et al., 2002; Ross, 2000; Slater, 1998; Umble et al., 2003; Saini et al., 2010
Sterring committee	Somers and Nelson, 2001
ERP software package selection	Somers and Nelson, 2001; Akkermans et al., 2002; Al-Mudimigh et al., 2001
Training resources	Kelley et al., 1999; Gupta, 2000; Al-Mashari et al., 2003; Bingi et al., 1999; Brown and Vessey, 2003; Saini et al., 2010; Umble et al., 2003; Wheatley, 2000; Sumner, 2000; Wright and Wright, 2001; Holland and Light, 1999; Al-Mudimigh et al., 2001; Zhang et al., 2002; Ross, 1999; Yakovlev and Anderson, 2001; Gallivan et al., 2005; Barker and Frolick, 2003
User involvement	Brown and Vessey, 1999; Krasner, 2000; Somers and Nelson, 2001; Zhang et al., 2002; Hong and Kim, 2002
Management expectation	Somers and Nelson, 2001; Akkermans and Helden, 2002; Saini et al., 2010

External Environment

External environment of an organization is related to customers, suppliers, government bodies and other external agencies. According to Foss and Stone (2003), ERP systems can help create a customer-driven or demand organization, which better serves the customer's value chain. ERP can also integrate corporate information and reach the corporate goals of rapid delivery of goods, lower costs, internationalization, and improvement of the whole enterprise's performance (Yen et al., 2002).

ERP system makes promises that it will enable organizations to integrate information about their entire enterprises seamlessly, including customer orders, production, purchasing, inventory, distribution, human resources, and receipt of payments (Daft, 2001; Fisher et al., 2004; King, 2005; Lall and Teyarachakul, 2006; Nah and Delgado, 2006; Zviran et al., 2005). Zhang et al. (2002) stated different benefits of ERP which include improvement of customer service, better way for production scheduling and

manufacturing cost reduction. ERP systems are multi-module application software that helps enterprises manage their important processes, including production planning, purchasing, inventory management, suppliers' management, etc. ERP systems facilitate the exchange of data among divisions. Consequently, ERP systems can reduce production and inventory costs, production demand and forecasting (Hasan et al., 2011).

Research Methodology

The study is directed to companies that had already implemented an ERP system. Specifically, the survey was administered to employee of the manufacturing companies who were involved in implementation process and are now the end-users. Three criteria guided the selection of the cases: (a) the firm should be in manufacturing, (b) it must have been using an ERP system for at least 1 year, and (c) it must have been using the system in at least two core business processes.

Data was collected from 67 manufacturing organizations that fulfilled the above criteria's and the sample of the study constituted of 750 individuals working in these manufacturing companies. Using non-probabilistic judgemental sampling, a total of 900 surveys were collected, after several follow-up e-mails and phone calls. The reliability control has shown that 16.7 percent of

respondents were unreliable, as some questions were left unattended. Moreover, in some cases, the observed responses were artificially inflated as a result of respondents' tendencies to respond in a consistent manner. The sample of 750 respondents was finalized with respect to the following classifications:

Classification of Respondents Demographics Profile

Gender	Male	547
	Female	203
Age	20-35	198
	36-50	422
	51-65	130
Educational Qualification	Graduate	221
	Post Graduate	467
	Diploma	62
Position in company	Junior level	160
	Middle level	485
	Senior level	105

Also, given that the phenomenon under study, effects of ERP, is complex and that one requires a deeper understanding of it in its actual context, a qualitative methodology is more appropriate (Bourlakis and Bourlakis, 2006). Hence, the focus of this paper will be on the operational and intangible gains resulting from ERP implementation (which will be operationalised by many variables tested in this study). The performance indicators chosen were actually taken by the managers and ERP vendors through the interviews, together with the literature review.

PLS-Graph was used to test the hypothesized relationships among the study variables. The choice was motivated by several considerations. PLS is a non-parametric estimation procedure (Wold, 1982). Its conceptual core is an iterative combination of principal components analysis relating measures to constructs, and path analysis capturing the structural model of constructs. The structural model represents the direct and indirect causal relationships among constructs. It can be used to estimate models that use both reflective and formative indicators, is more appropriate for analyzing moderating effects because traditional techniques cannot account for measurement error in exogenous constructs (Fornell and Bookstein, 1982) allows for modeling latent constructs under conditions of non-normality, and is appropriate for small to medium sample sizes (Chin, 1998a, 1998b; Chin and Newsted, 1999).

Results And Discussion

The model was designed to study the effect of different people resources of ERP during implementation phase on

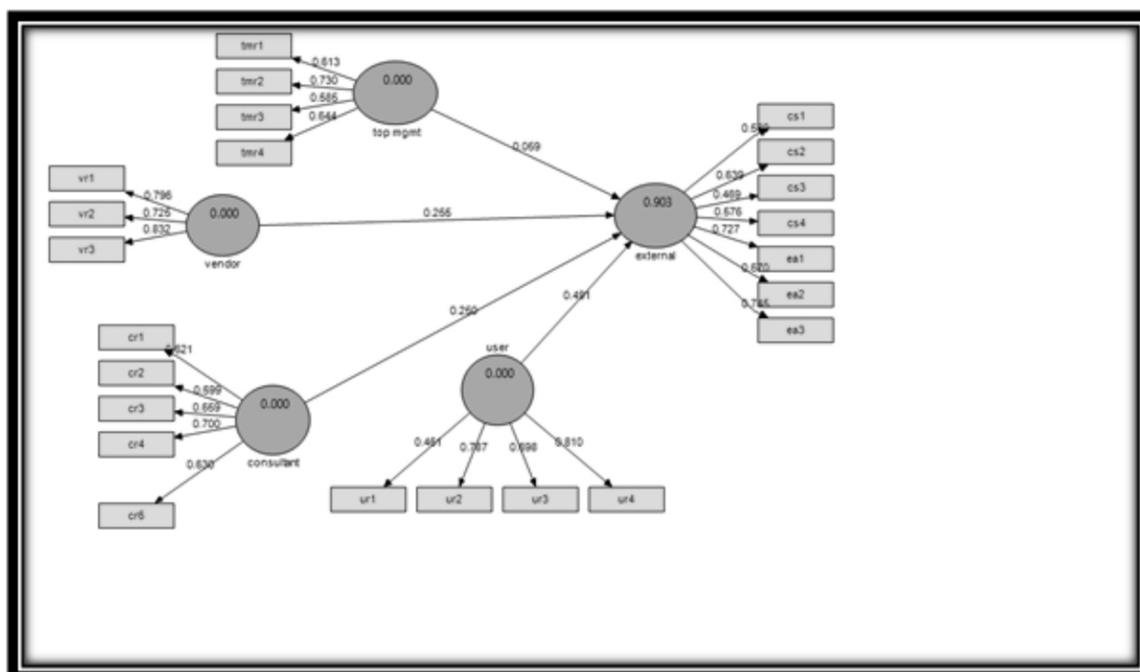
the changes caused by ERP on internal process of an organization. To assess the psychometric properties of measurement model, individual item loadings, internal consistency, convergent validity, and discriminant validity were examined of the reflective first-order factors (top management, user, vendor and consultant resources). The loadings of the measurement items on their respective factors were examined. Finally, the model included the items whose loading were above the threshold value on their respective factor and were statistically significant at the 0.001 level, which provides support for convergent validity (Figure 1). Two items (There was a good relationship and communication with project team and ERP system was delivered at a promised time frame) were deleted from consultant resources and vendor resources respectively.

The study assessed convergent validity by examining composite reliability and average variance extracted from the measures. Although many studies have used 0.5 as the threshold reliability of the measures, 0.7 is a recommended value for a reliable construct (Chin, 1998a, 1998b). For the reflective measures, rather than using Cronbach's alpha, which represents a lower bound estimate of internal consistency due to its assumption of equal weightings of items, a better estimate can be gained by using the composite reliability measure (Chin and Gopal, 1995). As shown in Table 1, the internal consistency clearly exceeded 0.70, suggesting strong reliability. For the average variance extracted by a measure, a score of 0.4 indicates acceptability (Fornell and Larcker, 1981). From the table it is clear that AVE by all reflective measures is greater than 0.4, which is above the acceptability value.

Table 1: Verification of Convergent Validity

	AVE	Composite Reliability	Cronbachs Alpha
consultant	0.413188	0.778286	0.647767
top mgmt	0.416233	0.739022	0.536064
user	0.493745	0.789473	0.643474
vendor	0.617584	0.828456	0.68837

Figure 1: Model Displaying Relationship Between People Resources of Implementation Phase and Change Caused by ERP on External Environment After Removal of Some Items.



Finally, the study verified the discriminant validity of the instrument by comparing the average variance extracted (AVE) (Fornell and Larcker, 1981). It is clear from the table 2 that the square root of the average variance extracted for

each construct is greater than the levels of correlations with other constructs. The results of the inter-construct correlations also show that each construct shares larger variance with its own measures than with other measures.

Table 2 : Verification of Discriminant Validity

	consultant	top mgmt	user	vendor
Consultant	0.64031			
top mgmt	0.335572	0.6403124		
User	0.639626	0.520198	0.7	
Vendor	0.582307	0.513269	0.675359	0.781025

Discriminant validity is also confirmed, when items related to a particular factor have the highest load on that factor. When we look at the cross loadings table-3, we find that these conditions holds good.

Table 3: Cross Loadings Table

	consultant	top mgmt	user	Vendor
cr1	0.621449	0.084501	0.376128	0.354937
cr2	0.599305	0.170573	0.328566	0.293732
cr3	0.659133	0.274646	0.449869	0.424555
cr4	0.699837	0.333556	0.514397	0.480324
cr6	0.629558	0.17516	0.345996	0.263291
tmr1	0.204804	0.612807	0.252986	0.237496
tmr2	0.210447	0.729768	0.429068	0.454625
tmr3	0.223613	0.584594	0.324919	0.307964
tmr4	0.235633	0.644273	0.307553	0.285192
ur1	0.46178	0.21588	0.660548	0.253366
ur2	0.57964	0.352659	0.787318	0.696246
ur3	0.370845	0.536863	0.698021	0.625394
ur4	0.417798	0.333883	0.809797	0.632195
vr1	0.57964	0.352659	0.787318	0.796246
vr2	0.370845	0.536863	0.698021	0.725394
vr3	0.417798	0.333883	0.809797	0.832195

The PLS modeling approach involved two steps - validating the measurement model and then fitting the structural model. The former is accomplished primarily by reliability and validity tests of the measurement model, followed by a test of the explanatory power of the overall model by assessing its explained variance, and the testing of the individual hypotheses (structural model). The model shows that the explanatory power is 90.1 % which is considered excellent for the studies of this nature. For testing the individual hypotheses, a bootstrap re-sampling procedure was conducted and coefficients were estimated.

H01: User Resources during implementation phase of ERP

system does not have an association with change caused by ERP system on external environment.

H02 : Top Management Resources during implementation phase of ERP system does not have an association with change caused by ERP system on external environment.

H03: Vendor Resources during implementation phase of ERP system does not have an association with change caused by ERP system on external environment,

H04: Consultant Resources during implementation phase of ERP system does not have an association with change caused by ERP system on external environment.

Table 4: Correlation between Different Components of ERP in Implementation Phase and external environment of an Organization

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	Standard Error (STERR)	T Statistics (O/STERR)
consultant -> external	0.249914	0.250505	0.061264	0.061264	4.079299
top mgmt -> external	0.058854	0.058808	0.038005	0.038005	1.548584
user -> external	0.490952	0.469556	0.193872	0.193872	2.53235
vendor -> external	0.255143	0.272763	0.180189	0.180189	1.415972

The hypothesis H01 and H04 are rejected since the tabulated value is more than 1.645 hence there is a relationship between consultant resources and user resources in ERP implementation phase and external environment of an organization. In our model, components of ERP in implementation phase explained 88.9 percent of variance for internal processes. Ifinedo and Nahar (2009) used SEM techniques and assessed the structural model and found that R2 is 0.18, which suggests that the exogenous factors explained 18 percent of the variance in the ERP success construct and considered it adequate for a study of this nature. The results of their study indicated strong positive relationships between IT assets and IT resources, on the one hand, and ERP success, on the other.

Having clarity about ERP adoption vis-a`-vis business vision positively impacts the overall success of the software (Davenport, 2000; Deloitte Consulting, 2000; Stefanou, 2001). Success or failure hinges on the effective collaboration among the project teams, the business knowledge of internal business experts and the technical skills of outside IT consultants. On the other hand, Sammon and Adam (2005) argue that unsatisfactory success rates of ERP implementations to date is not an indication of the failure of ERP as a concept, it is the result of inadequate analysis of business requirements in preparation for ERP projects.

Consultants may be involved in various stages of the implementation: performing requirements analysis, recommending a suitable solution, and managing the implementation. Since, consultants understand the business and translate the ERP requirements to the organization and process levels, organizations should attempt to maximize their compatibility with their consultant resources. Our study indicated that consultant resources contribute to the success of ERP systems. In accordance Ein-Dor and Segev (1978), Thong et al. (1996) and Bajwa et al. (1998) identified that external expertise positively influence the success for IT systems. Gefen and Ridings, (2002) study also affirms that the systems' benefits and impacts tend to be rated highly when quality vendors/consultants are engaged.

Our study indicated that user resources contribute to the success of ERP systems on external environment of an organization. This seems to be true since the users are the main actors of the ERP system. If they are not satisfied, the processes will not be done in the intended manner. Also, since ERP system implementation changes the way in which the organization works, changes the physical environment and social environment. All these will definitely revoke resistance from the employees and has to be managed effectively before, during and after the implementation of the ERP system. Wu and Wang (2006) pointed that complexity may affect the amount of effort in ERP projects It's impossible to succeed in a technological application

unless people have positive attitudes about it and behave in ways that enable to get benefit from it. Yang et al. (2006) suggested that the key success factor for implementing ERP system is the people-centered.

Peslak et al. (2008) found that the two significant phases which directly influenced preferred ERP use were preparation and training phase, and performance and usefulness phase. Neither transition nor maintenance was found to significantly affect preferred ERP use. Longinidis and Gotzamani (2009) results indicate that three main components that affect the level of satisfaction of an ERP user are interaction with the IT department, pre-implementation processes and ERP product and adaptability. Gore et al. (2011) also suggests that the first problem is retaining the ERP trained employees and hiring more qualified people. Issues pertaining to personnel were a go live issue in 62% of the cases (Krasner, 2000). Poston and Grabski (2001) found the number of employees is reduced after the implementation of ERP.

Ziad et al. (2010) study shows that there is a positive relationship between ERPs implementation success and employee satisfaction, also there is a statistical relationship between enhancement and ERPs success, weak relationship between ERPs success and ease of use and training factors as well as most of these companies depended on the internet. Daoud and Triki (2013) results showed there was a significance impact from the user's satisfaction and enhancement factor on ERPs implementation success, while there was no significance impact from the ease of use and training on ERPs implementation success.

Conclusions And Suggestions

The results indicated that consultant resources and user resources were associated with changes caused by ERP system on external environment of an organization. Hence, the management should make sure that adequate infrastructure is planned for in a way that it becomes reliably available well in time (both for the pre-implementation and the post-implementation stages). The outcome of the study indicated that unlike other information systems, the major problems of ERP implementation are not only technologically related issues such as technological complexity, compatibility, standardization, etc. but also organization and human related issues. Hence, users should be well informed of the projects to avoid misleading assumptions and speculations regarding the project. A high level of sustainable employee morale and motivation is also required throughout the implementation. It is recommended that the training facilities should be developed and training should encompass the development of IT skills and should be a comprehensive training plan, which must be a part of master implementation plan.

Consultant should ensure network support, deploying of adequate server/ network, even during the training/ modelling phase and introducing new PCs with latest configuration. Taking into account the most important needs of the implementation; the overall ERP architecture should be established well before the deployment. To ease the process; rigorous and sophisticated software testing should be performed. Variety of test cases should be executed in order to perform a rigorous system testing before the system goes live. This includes performing simulation and executing test cases to check the robustness of the system. The ERP team should consist of “best and brightest brains” in the organization. It should include cross-functional expertise and a blend of internal staff and the external consultants. The amount of interaction between them makes the contributing factor for the success of the project. Communication among various functions/levels and specifically between business and IT personnel is another identified critical area. This requires a communication plan to ensure that open communication occurs within the entire organization, including the shop-floor employees as well as with suppliers and customers.

The present study was carried out in manufacturing organizations only due to some special characteristics of manufacturing. A similar study examining the same subject in a diverse sample of other types of organizations could serve to further extend and enhance these findings in different types of industry. This opens the scope of comparative research in the ERP system; since users belonging to different type of organizations will have different exposure and perception related to ERP system. The participant biases may not have comprised the data. The participant may not understand the question, not want to tell the whole truth or may not remember what happened. Further, time pressures may limit the participants' attention to each question, force a superficial answer. Also, longitudinal data gathered after a satisfactory time frame from the same companies, by surveying the same respondents, will reveal whether satisfaction level has changed and which factors, if any, contributed to this change.

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