



No. 112/2015-16

Working Paper Series

Absorptive Capacity and ERP Assimilation:

The Influence of Company-Ownership

by

Madhavi Latha Nandi

Assistant Professor,

*T.A Pai Management Institute,
Manipal-576104, Karnataka, India.*

Phone: 0820- 2701079, email: madhavi@tapmi.edu.in



Absorptive Capacity and ERP Assimilation:

The Influence of Company-Ownership

by

Madhavi Latha Nandi

Assistant Professor,

T.A Pai Management Institute,

Manipal-576104, Karnataka, India.

Phone: 0820- 2701079, email: madhavi@tapmi.edu.in

TAPMI Working Paper No. TWP 112/2015-16



**T. A. PAI Management Institute
Manipal – 576104, Karnataka**

Absorptive Capacity and ERP Assimilation: The Influence of Company-Ownership

by

Madhavi Latha Nandi

Assistant Professor,

T.A Pai Management Institute,

Manipal-576104, Karnataka, India.

Phone: 0820- 2701079, email: madhavi@tapmi.edu.in

Working Paper No: TWP No. 112 / 2015-16 / 06

Abstract: In this study, two different perspectives on absorptive capacity were adopted to examine its impact on ERP assimilation. While the results reaffirm earlier work showing the importance of connectedness and cross-functional interfaces on ERP assimilation, other two factors (prior IT knowledge and formalization) were not found to be positively related to ERP assimilation. To obtain more insights regarding the latter unexpected results, the study checked how the nature of company ownership (private or state-owned) might exert an interaction effect. The results pointed to the existence of a negative relationship between prior IT knowledge and ERP implementation particularly in the case of private companies as opposed to state-owned firms. The theoretical and practical implications of these results are subsequently discussed.

Key words: Keywords: Absorptive capacity, Combinative Capabilities, Knowledge Integration, ERP Assimilation, Ownership, Enterprise Systems, India, State-owned Enterprises

Absorptive Capacity and ERP Assimilation: The Influence of Company-Ownership

1 Introduction

ERP systems pose multiple challenges to organizations during their implementation and post-implementation phases. These arise from the large scope of the projects involving the whole organization and not merely subgroups or units (Palaniswamy & Frank, 2002) and are aggravated by the imperatives for changes in established business processes to achieve alignment with best practices implicit within the ERP systems (Davenport, 1998). Additionally, the proposed changes often involve key business issues concerning strategy, technology, culture, management systems, human resources, and structure (Al-Mashari, 2003) necessitating high levels of commitment from all the stakeholders, especially the top management (Grossman & Walsh, 2004). It is thus, not surprising that while these systems come with the promise of obvious benefits from automation and integration, they also carry a risk of failure (Davenport, 1998). In this study, we focus on the concept of ERP assimilation to explore some aspects of the complex and dynamic factors that could lead to ERP success. For this, we utilize the concept of absorptive capacity (Cohen & Levinthal, 1990) which reflects an organization's ability to absorb and use external knowledge. ERP implementation and routinization are knowledge-intensive processes and thus, a focus on absorptive capacity of the firm is expected to throw better light on how these can be specifically influenced by the dynamics of knowledge and associated processes. More specifically, we examine the connection between prior related knowledge (Cohen & Levinthal, 1990) and knowledge integration capabilities (Cohen & Levinthal, 1990; Zahra & George, 2002) on ERP assimilation.

Additional challenges arise in the context of developing economies with regard to the implementation and use of ERP systems (Huang & Palvia, 2001) and many particular factors come to light in the context of India (Annamalai & Ramayah, 2011; Garg & Garg, 2013) making it an interesting context for our inquiry. Prompted by the results of our initial part, we probe further to explore how the nature of ownership of the company might have an impact on the relationship between prior related knowledge and ERP assimilation. In India, the legacy of a centrally planned economy has resulted in the creation of a number of state-owned enterprises. These companies have played an important role in the industrial development of the country with mixed results. While there have been a number of successful state-owned enterprises, there are many others that have failed to perform as expected and are periodically infused with state funds to continue their operations. In general, many of the problems faced by state-owned enterprises elsewhere have been attributed to their managerial and organizational peculiarities (Kostera & Wicha, 1996). More specifically, they tend to be slow in the adoption of new business practices (Boisot, 1996) and face a different set of pressures related to techno-economic and institutional aspects of business (Vicente-Lorente & Suárez-González, 2007). Many of these factors also are true for India (Ramaswamy & Renforth, 1996; Awasthy, Chandrasekaran, & Gupta, 2011; Oberoi, 2013) and these assume increased relevance because of the large number of state-owned enterprises that operate in core sectors of the economy. Thus, in this study we extend our investigation of the relationship between factors associated with absorptive capacity and ERP assimilation to include an examination of the interaction effect of nature of ownership on prior IT knowledge.

2 Literature Review

2.1 Organizational absorptive capacity

The concept of absorptive capacity was proposed by Cohen and Levinthal (1990) and focuses on how learning and subsequent performance are related to what people already know. They found that the cumulateness and the path dependency of knowledge and learning can also be extended to the organizational level. Thus they define organizational absorptive capacity as an organization's capability to identify, assimilate and apply external knowledge to commercial ends (Cohen & Levinthal, 1990). Organizational absorptive capacity has been conceptualized and empirically supported to be influencing the firm's innovative behavior, which includes technology adoption and diffusion (Lane, Salk, & Lyles, 2001; Malhotra, Gosain, & Sawy, 2005; Szulanski, 1996; Teo, Wan, Wang, & Wei, 2003). It is path dependent in nature that is, by accumulating absorptive capacity in one period in terms of possessing related expertise and knowledge sharing routines an organization can more readily assimilate and integrate the additional knowledge that is critical for its innovative behavior (Cohen & Levinthal, 1990).

Further conceptualizations of absorptive capacity have differentiated between 'potential' and 'realized' absorptive capacities (Zahra & George, 2002). Abilities related to acquisition and assimilation of external knowledge is considered as the former and abilities related to transformation and exploitation of knowledge are considered as the latter. This differentiation between potential and realized absorptive capacities has subsequently been re-examined highlighting their overlaps, interaction and mutual influence (Lane, Koka, & Pathak, 2006; Todorova & Durisin, 2007).

In information systems research, the idea of absorptive capacity has been used in several studies exploring its role in IT implementations (Volkoff, Elmes, & Strong, 2004), its relationship with IT intensity in affecting dimensions of performance (Chen & Russell, 2004), and its impact on IT success (Harrington & Guimaraes, 2005). Roberts, Galluch, Dinger, and Grover (2012) found that research utilizing the concept of absorptive capacity in information systems literature has adopted two predominant perspectives. The first, labeled as the 'asset perspective' adopts a static view of absorptive capacity that focuses on how knowledge as a resource that can be acquired and transferred. The asset perspective treats absorptive capacity as essentially a knowledge base that can be developed through path-dependent accumulation. The second perspective labeled as the 'capabilities perspective' treats absorptive capacity as substantive or dynamic capability. The capability perspective of absorptive capacity refers to the routines and processes that firms use to identify, assimilate, transform, and apply external knowledge. Studies adopting this perspective capture absorptive capacity using measures pertaining to compensation policies, dominant logic, knowledge-sharing routines, and competencies (Lane and Lubatkin 1998; Lane et al. 2001). In this study, we seek to incorporate both the asset perspective that privileges the notion of prior related knowledge and a capabilities perspective that focuses on internal knowledge integration mechanisms. Utilizing these perspectives we operationalize absorptive capacity in both ways to reflect complimentary views in the literature.

2.2 The asset perspective of organizational absorptive capacity

The asset perspective focuses on the key role of prior knowledge possessed by the organization and how that helps in the cumulative addition of new knowledge resulting in positive outcomes.

Cohen and Levinthal (1990) pointed to the importance of knowledge acquisition and transfer. Both of these are in line with the core assumption that knowledge can be possessed in some way, and the focus on prior knowledge as a necessary condition for further accumulation is a result of this emphasis on possession. From this perspective, when a firm already has some knowledge related to the in-flowing external knowledge in terms of experience or existing stocks of knowledge, it becomes easy for the organization to assimilate the knowledge entering into the organization. Marabelli and Newell (2014) refer to this perspective as employing an epistemology of possession where knowledge is owned, commodified and transferred. Adopting this perspective, absorptive capacity is approached through measures such as number of patents (Ahuja & Katila, 2001), and stocks of implementation knowledge (Ko, Kirsch, & King, 2005). It is also evident in works such as Vega-Jurado, Gutiérrez-Gracia, and Fernández-de-Lucio (2008) that focussed on different types of knowledge and found that depending on the type of knowledge, certain factors influencing absorptive capacity become more or less important. In the context of ERP systems, implementation knowledge and its transfer (Xu & Ma, 2008) has been considered the most important. However, Liang, Saraf, Hu, and Xue (2007) specifically focused on ERP assimilation and found that the acquisition of new knowledge was facilitated by the intensity and depth of related prior knowledge. Deng, Doll, and Cao (2008) also found a link between absorptive capacity and productivity in the context of engineers' IT-enabled work. Examining small scale enterprises in the context of India Sharma, Daniel, and Gray (2012) also found that prior knowledge of senior managers contributed considerably to the development of absorptive capacity. Drawing from these, in this study, prior IT knowledge possessed by organizations is expected to be positively related to ERP assimilation.

2.3 The capability perspective of organizational absorptive capacity

Prior related knowledge and exposure to more new knowledge does not automatically result in enhanced levels of innovation. In their work, Cohen and Levinthal (1990) pointed to a focus on the structure of communication between the external environment and the organization, as well as among the subunits of the organization, and also on the character and distribution of expertise within the organization (p. 132). These are associated with specific knowledge integration mechanisms existing within the organization and are often labeled combinative capabilities that help in the integration of the acquired knowledge with existing (Kogut & Zander, 1992).

Later work has examined these capabilities more closely and classified them as systems capabilities, coordination capabilities, and socialization capabilities (Jansen, Van Den Bosch, & Volberda, 2005; VanDenBosch, Volberda, & DeBoer, 1999). Systems capabilities relate to policies and procedures that are often used to integrate knowledge. Here, knowledge is absorbed with the help of ex-ante rules and procedures. Organizational members exchange and combine explicit knowledge through formal exchange mechanisms such as formal language, codes, working manuals etc. Thus formalization is the prominent mechanism associated with systems capabilities. The second is routinization which is a mechanism that refers to a programmed mode of action ensuring very little discretionary effort in the execution repetitive tasks.

Coordination capabilities enhance knowledge absorption through relationships between members of a group. These methods of coordination might be explicitly designed or may also

emerge from a process of interaction. Coordination capabilities accumulate in an organization as a result of natural liaison devices such as cross-departmental teams, and participation. There are three mechanisms that are commonly associated with coordination capability. These are cross-functional interfaces, participation in decision making and job-rotation (Jansen et al., 2005). Cross functional interfaces refer to the degree to which communication is facilitated by the mechanisms for knowledge exchange between teams and functions. Participation denotes the existence of a decentralized approach where managers are empowered to make decisions. Lastly, job rotation denotes the number, length and breadth of the opportunities afforded for movement between jobs (Gebauer, Worch, & Truffer, 2012).

The socialization capabilities of an organization can be interpreted at the structural level by the density of linkages present in the organization and at the ideational level by the type of socialization tactics employed by the organization. The density of linkages is reflected in how connected the members of the organization are both horizontally across departments and vertically along the hierarchical structure. At the ideational level, it refers to the ability of a firm to produce a shared ideology that offers members an identity as well as collective interpretations of reality (Jansen et al., 2005).

2.4 ERP assimilation

The literature on ERP systems is extremely rich in the delineation of knowledge issues associated with system implementation. However, it has been pointed out that intricate implementation plans are not sufficient to ensure post-implementation use of large and complex ERP systems (Liang et al., 2007). A number of complex factors affect the use of ERP systems and these have been elaborated in works examining in the fit of ERP systems with organizational processes -- elements of which can vary depending on the wider context within which the organization is embedded (Pedro, Tiago, Björn, & Miguel, 2013). In this study, we refer to post-implementation use and routinization as ERP assimilation. This is in alignment with the broader concept of IT assimilation defined by Purvis, Sambamurthy, and Zmud (2001) as "the extent to which the use of the technology diffuses across the organizational projects or work processes and becomes routinized in the activities of those projects and processes" (p. 121).

More specifically, examining ERP assimilation using the concept of absorptive capacity Saraf, Liang, Xue, and Hu (2013) assert that in the assimilation of large scale ERP systems, all the routines of absorptive capacity are likely to be active except transformation. This is because, ERP use does not create fundamental changes in the nature of the product. However, the enactment perspective on ERP implementation points to how it can be re-invented in use (Boudreau & Robey, 2005). This also connects to the four-phase model popular in the literature on absorptive capacity which indicates a linear progression from acquisition through assimilation and transformation to exploitation (Zahra & George 2002; Jansen, et. al, 2005). In terms of the four phases, this link between absorption and transformation connects the key differentiation between potential and realized absorptive capacities (Todorova & Durisin, 2007). Moreover, Marabelli and Newell (2014) illustrate how the pipeline-image which has resulted from the four routines associated with absorptive capacity does not reflect the interactions between them. So they treat recognition, assimilation, transformation and exploitation as mutually influencing in a non-linear fashion. However they maintain that these

are essentially distinct and conceptually separable. Resultantly, though we recognize the interaction between the different routines, our study focusses essentially on assimilation.

3 Theoretical Framework

3.1 Prior Knowledge and ERP assimilation

In studies that focus on factors of learning and knowledge related to ERP systems, most have focused on the implementation stage. One important issue examined here concerns the knowledge transfer between the implementing organizations and the consultants (Kim, Lee, & Gosain, 2005; Ko et al., 2005; Sharma et al., 2012; Xu & Ma, 2008). These studies generally establish the importance of absorptive capacity in the exchange of knowledge between consultants and clients in ERP implementation.

However, the value of knowledge and learning processes are also important at the assimilation stage and this focus is often evident in general examinations of IT assimilation (Attewell, 1992; Fichman & Kemerer, 1999). More specifically, adoption of best practices and ability to encourage internal discourses could lead to wider use and assimilation (Liang et al., 2007). It has also been found that there is a direct impact of both potential and realized absorptive capacities on ERP assimilation as well as a differential moderating effect of these on the effect of institutional pressures on the degree of assimilation (Saraf et al., 2013). Thus, it can be expected that prior-related knowledge is an important factor to be considered also in the post-implementation stage of ERP systems within organizations. Thus we advance the following hypothesis.

Hypothesis 1: Prior IT knowledge of the organization is positively related to ERP assimilation.

3.2 Combinative Capabilities and ERP assimilation

The key role of knowledge and learning in ERP implementation, use and value creation also calls for an understanding of mechanisms associated with the flow of knowledge within the organization. Thus combinative capabilities carry a special relevance in the ERP assimilation. Internal mechanisms, also known as knowledge integrating mechanisms refer to the formal and informal elements available in an organization that enable the spread external knowledge and the subsequent generation of new forms of knowledge. Zahra and George (2002) assert that "social integration contributes to knowledge assimilation occurring either informally (e.g., social networks) or formally (e.g., use of coordinators)" (p.194) and results in eventually reducing the gap between potential and realized absorptive capacities. Drawing from earlier work that identifies the effects of various components of knowledge integration on the critical mechanisms of assimilation and transformation (Jansen et al., 2005; Zahra & George, 2002) we identify the following as key mechanisms relevant for the purpose of our study.

1. System Capability ó Formalization:

Formalization refers to the degree to which a codified body of rules, procedures, or behavior prescriptions is developed to handle decisions and work processing (Pierce & Delbecq, 1977). It reflects the extent to which an organization emphasizes rules and procedures in the

performance of their tasks (Rogers, 1983). There are indications that a highly formalized environment tends to restrict openness in the social system and forces individuals to deviate from the structured behavior to experiment with new problem-solving methods (Jansen et al., 2005; Pierce & Delbecq, 1977). However, formalization acts as a frame of reference that directs attention towards particular aspects of external environment. Higher levels of formalization could also mark the existence of highly rationalized decision mechanisms that generally facilitate the innovation adoption process (Zmud, 1982). Also, formalization influences perceptions held by organizational members toward legitimacy of task behaviors and promotes singleness of purpose (Pierce & Delbecq, 1977; Zmud, 1982). As a mode of formal communication in an organization, formalization enables codification of best practices (Grover & Goslar, 1993) and makes knowledge more accessible and easier to apply, and subsequently helps exploit innovation to the intended level. Thus there is not enough evidence to show that formalization is associated with only negative effects on absorptive capacity. In fact, Jansen et al. (2005) found that formalization contributed to realized absorptive capacity and did not decrease potential absorptive capacity as they had hypothesized. They reason that this could be because well-designed procedures could aid the capture of experiences and thus help in acquisition and assimilation of related knowledge. Thus, in this study, we hypothesize that formalization would have a positive influence on ERP system assimilation.

Hypothesis 2: Degree of formalization in the organization is positively related to ERP assimilation.

2. Coordination capability -- Cross-functional interfaces

The existence of cross-functional processes is a core feature of integrated ERP systems. Coordination problems between departments can lead to various types of negative outcomes (e.g. Amrani, Rowe, and Geffroy-Maronnat (2006)). Thus we anticipated that the degree of cross-functional interfaces can greatly aid the process of ERP assimilation. As an organizational mechanism associated with coordination capability, it is likely to have a positive impact on rich and routinized use of the ERP system by enabling lateral communication and knowledge exchange across organizational units and lines of authority. Resultantly, it is expected to contribute to the organizational unit's ability to overcome differences, interpret issues, and build understanding about new external knowledge (Gupta & Govindarajan, 2000; Jansen et al., 2005). Earlier research has found that the degree of cross-functional interfaces is strongly related to acquisition, assimilation and transformation processes associated with absorptive capacity (Jansen et al., 2005). Thus, we expect that cross-functional interfaces are likely to have positive influence on ERP assimilation leading to the following hypothesis.

Hypothesis 3: Degree of cross functional interfaces in the organization is positively related to ERP assimilation.

3. Socialization capability ó Connectedness

Connectedness, which represents the density of linkages within the organization, encourages communication and enables trust and fosters commonality of knowledge (Jansen et al., 2005). Connectedness might have negative impact on the implementation process of the ERP system since it tends to limit the openness to information and alternative ways of doing things (Jansen et al., 2005). However, connectedness improves the efficiency of the knowledge exchange and therefore enables transformation and exploitation of the new knowledge (Jansen et al., 2005).

Further, differentiation is made between connectedness achieved through the use of weak ties and more intense connectedness utilizing strong ties across the subunits of an organization. The effect of these efforts is also likely to vary according to actual knowledge process involved. In the case of simple knowledge and the process of search, weak ties are likely to work better while in the case of complex knowledge and the process of transfer strong ties are likely to function better (Hansen, 2002). In the context of our study, ERP assimilation is likely to involve transfer and routinization of complex knowledge (Robey et al., 2002). Connectedness, thus, is expected to have a positive impact on the use and routinization of ERP system.

Hypothesis 4: Degree of connectedness in the organization is positively related to ERP assimilation.

4 Research Methodology

A cross-sectional survey design was chosen as the suitable data collection method, to achieve the objectives of the study. This methodology is particularly useful in the research setting where the constructs used are reasonably well understood (Edmondson & McManus, 2007) and the time frame relevant to the phenomenon is current time or recent past (Pinsonneault & Kraemer, 1993). Resultantly, independent and dependent variables are reasonably clearly defined and a specific model of the expected relationships can be tested.

4.1 Sampling Plan

Companies in India that had implemented an enterprise system package available in the market and have been using it for at least two years were considered for the present study. The dip in the organizational performance in the initial phase after the implementation is well-discussed in the literature (Davenport, 1998; Jones et al., 2011). Companies that had home-grown ERP systems were kept out of the present study's scope, for the reasons of homogeneity and comparability. Since an exhaustive list on companies that have implemented ERP system packages, was not readily available at the time of data collection, the vendors of ERP packages namely SAP, Oracle, and Microsoft Navision were consulted to identify the population size. The estimate for firms meeting the criteria given above was approximately 300 firms. Given the comparatively smaller population size, we decided to follow a convenient sampling approach to target as many companies as possible. We were able to identify suitable respondents who were senior managers and involved in the ERP implementation project in 100 firms.

4.2 Data Collection

Questionnaires were made accessible to these managers in three ways. The first was through an e-mail containing link to the questionnaire hosted online; the second through a paper version sent via post; and third through a paper version delivered by personal hand-delivery. Along with the identified senior manager, we also sought responses from another manager using the ERP system to cross validate the data and check for consistency. We received responses (from senior manager and another organizational member) from 53 organizations. Two of the responses were discarded since they were incomplete. Consequently, the data for the present study came from 51 usable responses. The companies involved were from a mix of sectors as

shown in Table 1. In terms of ownership, the sample contained 12 state-owned companies and 39 private companies.

Table 1. Sector-wise Categorization of Organizations (Based on Industry Classification Benchmark)

S. No.	Sector	Number of organizations
1	Oil and Gas (e.g., oil and gas production, distribution)	3
2	Basic Materials (e.g., chemicals, industrial metals, mining)	9
3	Industrials (e.g., construction, electronic and electrical equipment)	20
4	Consumer goods (e.g., automobiles and parts, food related products)	7
5	Healthcare (e.g., healthcare equipment and services, pharmaceuticals)	4
6	Consumer services (e.g., media, travel and pleasure, telecommunication)	3
7	Utilities (e.g., electricity, water, gas)	4
8	Technology (e.g., software and computer services, technology hardware)	1
Total		51

4.3 Measures

Items for the survey instrument were derived from the review of literature indicated above. The operationalization of each construct is discussed in detail in the following sections.

ERP Assimilation: The degree of Information system use is popularly used as a proxy for measuring the assimilation of the information system (DeLone & McLean, 1992). Studies dealing with ERP implementation have discussed IS use more often in terms of frequency and intensity of usage which can be largely objectively measured. However, these measures can be problematic if organizations studied have implemented information systems only partially resulting in a wide range in the extent of implementation in the sample. For example, some organizations may have limited the implementation of ERP system to certain business functions leading to lower frequency or intensity measures compared with others who have done more extensive implementations. Despite the lower frequency and intensity of the system use, such organizations may report higher system assimilation since it has fulfilled the anticipated needs of the organization and has become an integral part of the daily operations. Thus, the present study considers ERP assimilation in terms of the extent to which the ERP system is serving the purpose that was intended in an integrated way. Drawing the literature on IS assimilation indicated above, we use routinization, depth and non-substitutability as key indicators of the degree of ERP assimilation. Routinization refers to the extent to which ERP

system has become an integral part of the organizational business processes in the concerned areas; depth refers to the extent to which the incorporated features of the ERP system are being used and non-substitutability refers to the extent to which the organization does not rely on a parallel book keeping system to manage its operations.

Prior IT knowledge and three knowledge integration mechanisms: Prior IT knowledge was measured by assessing the extent to which managers and non-managerial personnel were familiar with the use of computers and computer related applications at the time of implementation. The three constructs representing the knowledge integrating mechanisms namely, formalization, cross-functional interfaces and connectedness were measured and tested separately for their influence on the dependent variable. A three-item scale derived from the scale used by Dewar, Whetten, and Boje (1980) was used to measure the formalization level of the organizations. Existence of cross-functional interfaces was measured by two items, based on the conceptual insights offered by Van Den Bosch et al. (1999), and Jansen et al. (2005), namely, the extent to which the organization relied on temporary teams representing different departments in problematic situations and the extent to which the special teams met and exchanged information. Connectedness was measured by three items based on the scales proposed by Van Den Bosch et al. (1999) and Jawroski and Kohli (1993), namely the ease with which organizational members can communicate across the ranks and positions, the extent of opportunity available for informal communication, and the ease with which the organizational members communicate across the departments.

4.4 *Data Analyses and Results*

Most of the variables that are used in the proposed research models are latent variables that are not observable or measurable directly, but are measured indirectly through observable variables that reflect or form the construct (Gefen, Straub, & Boudreau, 2000). This aspect necessitates the use of structural equation modeling (SEM) method for data analysis. Partial least squares (PLS) path analysis was chosen for the data analysis. PLS path analysis is a component based technique, which uses a series of OLS regressions to derive the model estimates, and is suitable for both predictive and confirmatory modeling (Chin, 2010; Gefen, Rigdon, & Straub, 2011; Gefen et al., 2000). Moreover, small sample is not a major constraint since PLS method analyzes one construct at a time and aims at minimizing the residual variance of all the dependent variables in the model (Chin, 2010; Gefen et al., 2000). Before carrying out the measurement and structural model validations, the sample data was checked for inter-rater agreement, common method bias and uni-dimensionality using ratio method, Harman's one-factor test and principal component analysis respectively. It is to be noted that the data collected from the additional organizational members was used only to assess inter-rater agreement. The data collected from the senior managers was used for the data analyses.

Inter-rater Agreement: Since the study involves analysis of perceptual data of organizational level constructs, inter-rater agreement score was calculated to validate whether the responses of the main respondents were in agreement with the responses collected from the managers. The inter-rater agreement score (r_{wg}) for each study construct was calculated using ratio method (Boyer & Verma, 2000;

Jansen et al., 2005). The inter-rater agreement scores for the constructs shown in Table 2 ranged between 0.81-0.9, indicating adequate levels of agreement.

Table 2. Inter-rater Agreement Results

S. No.	Construct	Inter-rater agreement score (r_{wg})
1	Prior IT knowledge (PIK)	0.9
2	Formalization (FOR)	0.81
3	Cross functional interfaces (CFI)	0.84
4	Connectedness (CON)	0.83
5	ERP Assimilation (ASM)	0.83

Common-method bias: The data was assessed for common-method bias using Harman's one factor test (Malhotra et al., 2005; Urbach & Ahlemann, 2010). Harman's one factor test is conducted on the sample data to assess for potential common method bias. The results of the test are presented in the Table 3. The maximum covariance explained most by a factor is approximately 33%, indicating the presence of multiple factors and therefore, no significant common-method bias.

Unidimensionality: Unidimensionality refers to a latent variable having each of its measurement items relate to it better than to any others (Urbach & Ahlemann, 2010). Unidimensionality is assumed *a priori* in carrying out validity and reliability tests using PLS SEM (Straub, Boudreau, & Gefen, 2004). Unidimensionality of the measurement items was validated using principal component analysis. The results shown in Table 4 indicated that the items converged to the corresponding constructs and loaded with a high coefficient on only one factor.

Construct reliability and validity: Before proceeding to hypotheses testing, the constructs were assessed for construct reliability, convergent validity and discriminant validity of the constructs, using measurement model evaluation of the PLS analysis and are presented in Table 5. The composite reliability scores of above 0.8 and Cronbach alpha values of above 0.6 confirmed the construct reliability. The AVE

Table 3. Harman's One Factor Test

Total Variance Explained						
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.963	33.027	33.027	3.963	33.027	33.027
2	2.001	16.674	49.701			
3	1.750	14.582	64.283			
4	1.024	8.536	72.818			
5	.742	6.183	79.001			
6	.672	5.598	84.598			
7	.500	4.163	88.761			
8	.435	3.623	92.384			
9	.324	2.703	95.088			
10	.247	2.058	97.145			
11	.218	1.817	98.962			
12	.125	1.038	100.000			

Table 4. PCA Results

Rotated Component Matrix ^a					
	Component				
	1	2	3	4	5
CON1	.142	.018	-.039	.864	.008
CON2	-.082	.313	.090	.699	.324
CON3	.382	.276	-.067	.610	-.076
CFI1	.190	.145	.449	.254	.668
CFI2	.273	.139	.143	-.006	.860
PIK1	.054	.908	-.021	.195	.102
PIK2	.078	.906	.068	.132	.122
FOR1	.047	.038	.870	-.088	.145
FOR2	.075	-.013	.882	.035	.139
ASM1	.775	.209	.278	.169	.095
ASM2	.917	-.057	.026	.033	.220
ASM3	.871	.037	-.025	.124	.125

Notes: Rotation Method: Varimax with Kaiser Normalization.

^a Rotation converged in 5 iterations.

scores for all the constructs were above 0.5 demonstrating convergent validity. The cross-loading matrix presented in Table 6 indicated support for the constructs' discriminant validity since all the items loaded greater than 0.7 on their respective constructs. Also the square root of AVE for each construct is greater than its correlation with other constructs, thus satisfying Fornell and Larckers criterion for discriminant validity (Hair et al., 2013).

Table 5. Construct's Composite Reliability (CR), Average Variance Extracted (AVE) Scores, and Inter-construct Correlations

Construct	CR	AVE	Cronbachs Alpha	CON	CFI	ASM	PIK	FOR
1 CON	0.805	0.583	0.670	0.764				
2 CFI	0.883	0.791	0.736	0.279	0.889			
3 ASM	0.917	0.788	0.867	0.373	0.444	0.888		
4 PIK	0.936	0.88	0.864	0.404	0.304	0.193	0.938	
5 FOR	0.891	0.803	0.757	-0.025	0.459	0.208	0.061	0.896

Notes: AVE square roots are shown as bolded in diagonal cells.

Table 6. Item Loadings

	ASM	CF	CON	FOR	PIK
ASM1	0.8716				
ASM2	0.8728				
ASM3	0.9139				
CFI1		0.8744			
CFI2		0.9038			
CON1			0.7685		
CON2			0.6305		
CON3			0.8708		
FOR1				0.8727	
FOR2				0.9188	
PIK1					0.9295
PIK2					0.9464

Hypotheses Testing: Hypotheses in the study were tested using the PLS structural model evaluation and are presented in Table 7 and Figure 1. Among the independent variables, connectedness and cross functional interfaces showed a significant relation with ERP assimilation with t-statistics of 3.25 and 3.543 respectively.

Figure 1. PLS Analysis Results

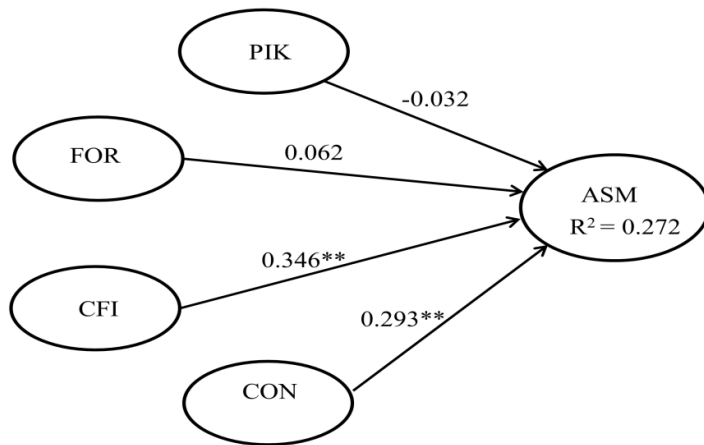


Table 7. Hypotheses Testing Results

Path	Path Coefficient ^b	Result
PIK -> ASM	-0.032 (0.323)	Not supported
FOR -> ASM	0.062 (0.657)	Not Supported
CON -> ASM	0.293** (3.25)	Supported
CFI -> ASM	0.346** (3.543)	Supported
R ²	0.272	
Q ²	0.153	

Notes: The numbers in parentheses are t-values.

*p < 0.1. **p < 0.05.

^bObtained from bootstrapping analysis

The results showed that only two of the four hypotheses were supported, namely those involving connectedness and cross-functional interfaces. As the other two constructs did not show a relationship with ERP assimilation as expected, we intended to probe further the factors that could point to the reasons for this. Since the ambivalence concerning formalization was comparatively less surprising among the two (Damanpour, 1991; Jansen, Van Den Bosch and Volberda, 2006) we decided to focus our attention on the construct of prior IT knowledge. We were particularly interested in exploring the interaction effect of other factors that might have influenced the results with regard to the construct of prior IT knowledge for three reasons. Firstly, centrality of prior knowledge and path dependent accumulation of new knowledge are core features of the original idea of absorptive capacity (Cohen & Levinthal, 1990). Therefore, the absence of a positive relationship between prior IT knowledge and ERP assimilation was particularly surprising. Secondly, we had adopted two complementary perspectives to guide our inquiry and prior IT knowledge was the only construct in line with the asset perspective.

This made it particularly interesting to probe further the surprising result in the case of this construct. Thirdly, we were prompted by the results to seek the possibility of a negative relationship between prior IT knowledge and ERP assimilation. From our familiarity with the context of the study and the our knowledge of the companies involved, we had noted considerable differences between state-owned enterprises and private firms in terms of previous exposure to IT related tools before ERP implementation. Our sample contained a number of state-owned firms and our experience of their differences with comparable private firms were significant. Thus we decided to probe the interaction effect of nature of company ownership in the relationship between prior IT knowledge and ERP assimilation.

Nature of Ownership: The research on how the nature of company ownership affects ERP assimilation is scarce and indecisive. For example, while Reimers (2003) found that there were differences in the assimilation of ERP systems between state-owned and privately owned foreign companies in China, Wagner and Antonucci (2009) report no such differences between both types of organizations in the United States. In India the pioneers of ERP implementation were the companies in the private sector (Balsmeier & Nagar, 2002), reinforcing the common perception of state owned companies as large mammoths with slow responsiveness to new business practices. Though studies have examined ERP implementation in state owned companies (e.g. Singla and Goyal (2007), the interaction effect of ownership on the relationship between knowledge related antecedent factors and ERP assimilation has not been examined. Thus, we specifically sought to find out how the nature of enterprise ownership moderates the impact of prior related knowledge on ERP assimilation.

Hypothesis 5: The nature of enterprise ownership moderates the relationship between prior IT knowledge and ERP assimilation.

Nature of ownership in the present study is a categorical variable representing ownership of an organization. State-owned companies were coded as 0 and private companies were coded as 1. The presence of interaction effect on the path prior IT knowledge-ERP assimilation was tested using the method proposed by Chin, Marcolin, and Newsted (2003) by validating the structural model comprising of prior IT knowledge and ownership as predictor variables and an additional path from an interaction term (between the prior IT knowledge and ownership) to the dependent variable that is, ERP assimilation. The results as shown in Table 8 and Figure 2 indicated a moderating effect. The interaction term showed a significant relation with ERP assimilation.

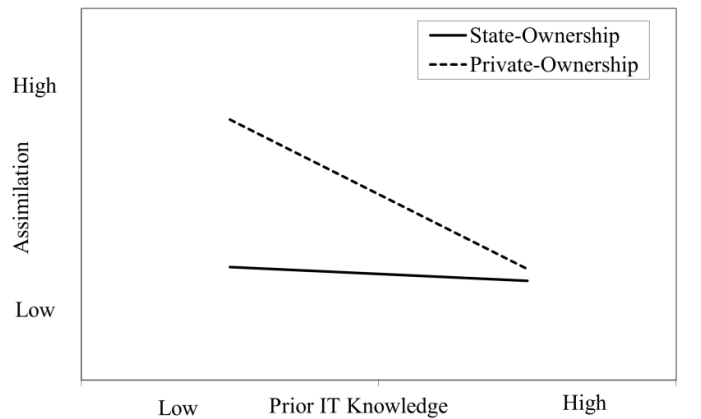
Table 8. Tests for Interaction effect of Nature of ownership

Predictor Variable	R ² without interaction term	R ² with interaction term	Cohen's effect size ^c	Path coefficient of interaction term	T-statistic of interaction term
PIK	0.163	0.239	0.1	-0.308	2.63**

* p < 0.1. **p < 0.05

^cCohen's effect size: 0.020 - Low, 0.15 ó Medium, and 0.35 ó Large

Figure 2. Interaction effect of Nature of ownership



5 Theoretical and Practical Implications

The results indicated above contribute to earlier research examining ERP assimilation in the light of absorptive capacity. While it reinforces earlier work pointing to the importance of combinative capabilities in absorptive capacity, it yields new insights particularly with regard to the role of prior knowledge in ERP assimilation.

First, while we expected that prior IT knowledge would be positively related to a higher degree of assimilation, we obtained results that indicated that prior knowledge did not have an effect or seemed to have acted as a barrier to deep assimilation pointing to the existence of other dynamics at play. This result was made more evident when we checked for interaction effect of company ownership revealing a strong negative relationship in the case of privately owned companies. The concept of knowledge inertia points to the possibility that individuals and organizations resort to problem-solving based on their past knowledge and experience, which in turn could impede new learning and innovation (Fang, Chang, & Chen, 2011; Liao, Fei, & Liu, 2008; Sharifirad, 2010). To overcome this, scholars have often pointed to the imperative for *unlearning* (Nystrom & Starbuck, 1984). Analyzing how top managers responded to crises, they found that prior learning made the crises worse in many cases. Studying entrepreneurial capabilities of organizations from emerging markets Zahra, Abdelgawad, and Tsang (2011) observed that unlearning involved *intentional discarding of practices* (p.324). Researchers have asserted the value of unlearning and removal of old memory in multiple contexts of new knowledge creation (Nonaka, Toyama, & Byosiene, 2001; Tsang & Zahra, 2008). Specifically related to absorptive capacity, Cepeda-Carrion, Cegarra-Navarro, and Jimenez-Jimenez (2012) assert that the unlearning context is an important determinant for absorptive capacity and that it enables the right balance between potential and realized absorptive capacities. Our results indicate that not all prior knowledge works towards enhancing absorptive capacity. Attention needs to be focused on why and how certain types of knowledge facilitate the addition of new knowledge while other types of prior knowledge inhibit the cumulative enhancement of knowledge. Thus the idea of path-dependence in absorptive capacity must be approached considering these complexities.

Secondly, it is remarkable that the negative impact of prior IT knowledge on assimilation was more evident in the case of private companies. This leads to the possibility that prior knowledge of IT possessed by these organizations did not lead in a path dependent way to facilitate new

knowledge creation involved in ERP assimilation. Rather, it acted as a barrier to new learning. However, it is interesting to note that this barrier effect was not as pronounced in state-owned companies. The particular reasons for this comparative insensitivity to prior related knowledge in state-owned enterprises needs further exploration.

Typically, state-owned enterprises (SOEs) are characterized by a number of lags including disproportionately large labor force, or inventory and product portfolios that are uncompetitive from a market perspective which can be liabilities (Uhlenbruck, Meyer, & Hitt, 2003). Market-oriented reforms of SOEs have been hampered by cultural lags (Kostera & Wicha, 1996). Their performance is influenced by a number of complex factors that differentiate them from private firms operating in the same markets and sectors (Goldeng, Grünfeld, & Benito, 2008). These characteristics are largely similar for state-owned enterprises in India having very distinct cultures that deeply influence the perceptions of managers (Khuntia & Suar, 2004), the effect of external factors on large scale change (Awasthy et al., 2011), corporate governance (Oberoi, 2013), and constraints for innovation (Manimala, Jose, & Thomas, 2006).

State owned enterprises show differences concerning the effect of competitive forces on their technical efficiency (Ramaswamy & Renforth, 1996), and face particular difficulties with regard to modernization of technology as these organizations do not adapt easily to technology that requires flexibility (Uhlenbruck et al., 2003). In the realm of information systems management, studies have found that state ownership would suggest important differences in factors such as procurement mechanisms, sensitivity to political cycles, responses to stakeholder groups and handling resource constraints (Bozeman & Bretschneider, 1986; Bretschneider, 1990; Caudle, Gorr, & Newcomer, 1991; Bugler & Bretschneider, 1993). There is evidence that many of these peculiarities of the public sector are likely to be applicable to state-owned enterprises as well. For example, Kanungo, Sadavarti, and Srinivas (2001) showed close relationship between innovative elements of IT strategy and aspects of culture peculiar to state-owned companies in India. Similarly, Rishi and Goyal (2008) studied factors affecting the implementation of strategic information systems in state owned companies in India and found that factors such as culture of the organization, management involvement, level of bureaucracy, systems and standards influenced the implementation of these systems in the companies studied.

Considering the above, one explanation for the comparative insensitivity of state owned firms to prior knowledge may relate to the existence of organizational slack which denotes the òpool of resources in an organization in excess of the minimum necessary to produce a given level of organizational outputö (Nohria & Gulati, 1996, p. 1246). More specifically, it has been found that slack resources have a positive impact on the relationship between unlearning and innovation (Yang, Chou, & Chiu, 2014). State-owned enterprises in India possess vast resources through special privileges and favorable regulatory provisions that can often result in large labor force and physical assets (Uhlenbruck et al., 2003). It has been shown that such slack could have both positive and negative results leading to the concept of an optimal level that might aid better organizational performance (Tan & Peng, 2003; George, 2005). It is possible that a similar effect is at play in our study leading to a decreased negative impact of prior IT knowledge on ERP assimilation. Another explanation might relate to the diversity of prior knowledge components. Private companies being more responsive to technological change was likely to have assembled a more diverse portfolio of technological solutions that

temporarily solved problems in a decentralized way. However, because of the complexity involved in technological discontinuities especially in emerging sectors, companies run the risk of being over ambitious in their efforts missing the "sweet spot" of optimal prior knowledge leading to organizational inertia (Vasudeva & Anand, 2011). In our case, private companies have missed this optimal level of prior knowledge leading to decreased assimilation at higher levels of prior IT knowledge.

Finally, our results point to how both asset perspective and capabilities perspective can be used in conjunction with each other to obtain useful insights. This is in line with other approaches that incorporate multiple perspectives in explorations of absorptive capacity (Lichtenthaler, 2010). Along comparable lines, Marabelli and Newell (2014) also point to the importance of "zooming in" and "zooming out" indicating complex interactions between multiple levels of analysis in the study of absorptive capacity.

At the level of practice, the importance of nurturing combinative capabilities is affirmed in this study. Reinforcing earlier studies on the topic, we found that degrees of connectedness and cross-functional interfaces are positively related to ERP assimilation and this points to the importance of nurturing both of these in attempts to sustain success in the post-implementation stage. The second implication relates to ownership. State owned companies are an important feature of many economies worldwide, especially in developing countries where state intervention in core sectors is deemed necessary for economic development. In India, there are a number of state-owned firms which are large in size and play key role in core sectors of the economy. Many of these companies have implemented ERP systems and this sector represents a considerable section of the market for ERP system vendors and consultants. Thus it becomes important that the interaction effect of ownership be considered by consultants and managers involved in ERP implementation. They need to adopt different strategies for private firms and state-owned enterprises by stressing unlearning more in the former and helping employees to leverage their resource slack to serve change in the desired direction in the latter.

6 Limitations and Conclusion

The following limitations must be considered in generalizing the results of our study. The first concerns the comparatively small sample size in our study, which is essentially the result of a small population. Since the unit of analysis is the organization, identifying and involving large number participating organizations that met our criteria was challenging. An attempt was made to overcome this shortcoming by conducting the necessary tests for verifying the required validities and predictive relevance of the models. Secondly, the differences among the ERP application packages are not accounted for in the study. In reality, there might be some differences in their features such as functionality, cost, and maintenance effort that might account partially for the differences in assimilation levels as these differences might have influenced the degree of assimilation. The third limitation is with regard to the technique used to test the moderating effect of state ownership. Multi-group analysis could have been the ideal option to test the moderating effect in the present study, since the moderator is a categorical variable. However, conducting multi-group analysis was not a feasible option in view of the smaller sample size. Alternatively, the study used product-indicator method of PLS path modeling to test the proposed interaction effect.

By utilizing two perspectives on absorptive capacity -- the asset perspective and the capabilities perspective -- this study sought to illustrate how different aspects of absorptive capacity can be brought to light while studying its impacts. The results indicated that in the capabilities perspective, higher degrees of connectedness and cross functional interfaces were found to be related to a higher degree of ERP assimilation. The former indicates the importance of lateral communication channels to facilitate knowledge exchange while the latter indicates how the efficiency of the knowledge exchange has important effects on ERP assimilation. Their particular importance in the post-implementation assimilation stage reinforces other studies that point to their importance in stages after the initial acquisition phase. In the asset perspective, particularly with regard to interaction effect, prior IT knowledge was negatively associated with the degree of assimilation indicating dynamics of knowledge inertia and the necessity for unlearning. Their decreased negative impact in the case of state-owned companies pointed to the importance of carefully balancing efforts at new knowledge search and incorporation to achieve optimal level of prior knowledge. It also indicates how the cushioning effect of features of state-owned firms such as slack might support technology change such as ERP implementation. These results are particularly relevant in the context of emerging, transition economies such as India where disinvestment of state-owned firms regularly generate discussions about their comparative strengths and weaknesses.

References

- Ahuja, G., & Katila, R. (2001). Technological acquisitions and the innovation performance of acquiring firms: A longitudinal study. *Strategic Management Journal*, 22(3), 197-220.
- Al-Mashari, M. (2003). A process change-oriented model for ERP application. *International Journal of Human-Computer Interaction*, 16(1), 39-55.
- Amrani, R. E., Rowe, F., & Geffroy-Maronnat, B. (2006). The effects of enterprise resource planning implementation strategy on cross-functionality. *Information Systems Journal*, 16(1), 79-104.
- Annamalai, C., & Ramayah, T. (2011). Enterprise resource planning (ERP) benefits survey of Indian manufacturing firms: An empirical analysis of SAP versus Oracle package. *Business Process Management Journal*, 17(3), 495-509.
- Attewell, P. (1992). Technology diffusion and organizational learning: The case of business computing. *Organization Science*, 3(1), 1-19.
- Awasthy, R., Chandrasekaran, V., & Gupta, R. K. (2011). Top-down change in a public sector bank: lessons from employees' lived-in experiences. *Journal of Indian Business Research*, 3(1), 43-62.
- Balsmeier, P., & Nagar, S. (2002). Implementing ERP in India: Issues and problems. *Journal of Transnational Management Development*, 7(3), 3-12.
- Boisot, M. H. (1996). Institutionalizing the labor theory of value: Some obstacles to the reform of state-owned enterprises in China and Vietnam. *Organization Studies*, 17(6), 909-928.
- Boudreau, M.-C., & Robey, D. (2005). Enacting integrated information technology: A human agency perspective. *Organization Science*, 16(1), 3-18.
- Boyer, K. K., & Verma, R. (2000). Multiple raters in survey-based operations management research: A review and tutorial. *Production and Operations Management*, 9(2), 128-140.

- Bozeman, B., & Bretschneider, S. (1986). Public management information systems: Theory and prescription. *Public Administration Review*, 46(6), 475-487.
- Bretschneider, S. (1990). Management information systems in public and private organizations: An empirical test. *Public Administration Review*, 50(5), 536-545.
- Bugler, D., & Bretschneider, S. (1993). Technology push or program pull: Interest in new information technologies within public organizations. In B. Bozeman (Ed.), *Public management: The state of art* (pp. 275-293). San Francisco, CA: Jossey-Bass.
- Caudle, S. L., Gorr, W. L., & Newcomer, K. E. (1991). Key information systems management issues for the public sector. *MIS Quarterly*, 15(2), 171-188.
- Cepeda-Carrion, G., Cegarra-Navarro, J. G., & Jimenez-Jimenez, D. (2012). The effect of absorptive capacity on innovativeness: Context and information systems capability as catalysts. *British Journal of Management*, 23(1), 110-129.
- Chen, J.-S., & Russell, K. H. C. (2004). An empirical study of the relationship of IT intensity and organizational absorptive capacity on CRM performance. *Journal of Global Information Management*, 12(1), 1-17.
- Chin, W. W. (2010). How to write up and report PLS analyses. In V. E. Vinzi, W. W. Chin, J. Henseler & H. Wang (Eds.), *Handbook of Partial Least Squares: Concepts, Methods and Applications* (pp. 655-690). Berlin, Germany: Springer Publishing Company Incorporated.
- Chin, W. W., Marcolin, B. L., & Newsted, P. R. (2003). A partial least squares latent variable modeling approach for measuring interaction effects: Results from a Monte Carlo simulation study and an electronic-mail emotion/adoption study. *Information Systems Research*, 14(2), 189-217.
- Cohen, W. M., & Levinthal, D. A. (1989). Innovation and learning: The two faces of R & D. *The Economic Journal*, 99(397), 569-596.
- Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, 35(1), 128-152.
- Damanpour, F. (1991). Organizational innovation: A meta-analysis of effects of determinants and moderators. *Academy of Management Journal*, 34(3), 555-590.
- Davenport, T. H. (1998). Putting the enterprise into the enterprise system. *Harvard Business Review*, 76(4), 121-131.
- DeLone, W. H., & McLean, E. R. (1992). Information systems success: The quest for the dependent variable. *Information Systems Research*, 3(1), 60-95.
- Deng, X., Doll, W. J., & Cao, M. (2008). Exploring the absorptive capacity to innovation/productivity link for individual engineers engaged in IT enabled work. *Information & Management*, 45(2), 75-87.
- Dewar, R. D., Whetten, D. A., & Boje, D. (1980). An examination of the reliability and validity of the Aiken and Hage scales of centralization, formalization, and task routineness. *Administrative Science Quarterly*, 25(1), 120-128.
- Edmondson, A. C., & McManus, S. E. (2007). Methodological fit in management field research. *The Academy of Management Review*, 32(4), 1155-1179.
- Fang, C.-H., Chang, S.-T., & Chen, G.-L. (2011). Organizational learning capability and organizational innovation: The moderating role of knowledge inertia. *African Journal of Business Management*, 5(5), 1864-1870.
- Fichman, R. G., & Kemerer, C. F. (1999). The illusory diffusion of innovation: An examination of assimilation gaps. *Information Systems Research*, 10(3), 255-275.
- Garg, P., & Garg, A. (2013). An empirical study on critical failure factors for enterprise resource planning implementation in Indian retail sector. *Business Process Management Journal*, 19(3), 496-514.

- Gebauer, H., Worch, H., & Truffer, B. (2012). Absorptive capacity, learning processes and combinative capabilities as determinants of strategic innovation. *European Management Journal*, 30(1), 57-73.
- Gefen, D., Rigdon, E., & Straub, D. (2011). An update and extension to SEM guidelines for administrative and social science research. *MIS Quarterly*, 35(2), iii-xiv.
- Gefen, D., Straub, D., & Boudreau, M.-C. (2000). Structural equation modeling and regression: Guidelines for research practice. *Communications of the Association for Information Systems*, 4(7), 1-77.
- George, G. (2005). Slack resources and the performance of privately held firms. *The Academy of Management Journal*, 48(4), 661-676.
- Goldeng, E., Grünfeld, L. A., & Benito, G. R. G. (2008). The performance differential between private and state owned enterprises: The roles of ownership, management and market structure. *Journal of Management Studies*, 45(7), 1244-1273.
- Grossman, T., & Walsh, J. (2004). Avoiding the pitfalls of ERP system implementation. *Information Systems Management*, 21(2), 38-42.
- Grover, V., & Goslar, M. D. (1993). The initiation, adoption, and implementation of telecommunications technologies in U.S. organizations. *Journal of Management Information Systems*, 10(1), 141-163.
- Gupta, A. K., & Govindarajan, V. (2000). Knowledge flows within multinational corporations. *Strategic Management Journal*, 21(4), 473-496.
- Hair, J. F., Hult, G. T. M., Ringle, C. M. and Sarstedt, M. (2013), *A primer on partial least squares structural equation modeling (PLS-SEM)*. Thousand Oaks, CA: Sage.
- Hansen, M. T. (2002). Knowledge networks: Explaining effective knowledge sharing in multiunit Companies. *Organization Science*, 13(3), 232-248.
- Harrington, S. J., & Guimaraes, T. (2005). Corporate culture, absorptive capacity and IT success. *Information and Organization*, 15(1), 39-63.
- Jansen, J. J. P., Van Den Bosch, F. A. J., & Volberda, H. W. (2005). Managing potential and realized absorptive capacity: How do organizational antecedents matter? *The Academy of Management Journal*, 48(6), 999-1015.
- Jansen, J. J. P., Van Den Bosch, F. A. J., and Volberda, H. W. (2006). Exploratory innovation, exploitative innovation, and performance: Effects of organizational antecedents and environmental moderators. *Management Science*, 52(11), 1661-1674.
- Jawroski, B. J., & Kohli, A. K. (1993). Market orientation: Antecedents and consequences. *Journal of Marketing*, 57(3), 53-70.
- Jones, D. C., Kalmi, P., & Kauhanen, A. (2011). Firm and employee effects of an enterprise information system: Micro-econometric evidence. *International Journal of Production Economics*, 130, 159-168.
- Kanungo, S., Sadavarti, S., & Srinivas, Y. (2001). Relating IT strategy and organizational culture: An empirical study of public sector units in India. *The Journal of Strategic Information Systems*, 10(1), 29-57.
- Khuntia, R., & Suar, D. (2004). A scale to assess ethical leadership of indian private and public sector managers. *Journal of Business Ethics*, 49(1), 13-26.
- Kim, Y., Lee, Z., & Gosain, S. (2005). Impediments to successful ERP implementation process. *Business Process Management Journal*, 11(2), 158-170.
- Ko, D.-G., Kirsch, L. J., & King, W. R. (2005). Antecedents of knowledge transfer from consultants to clients in enterprise system implementations. *MIS Quarterly*, 29(1), 59-85.
- Kogut, B., & Zander, U. (1992). Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization Science*, 3(3), 383-396.

- Kostera, M., & Wicha, M. (1996). The 'divided self' of Polish state-owned enterprises: The culture of organizing. *Organization Studies*, 17(1), 83-105.
- Lane, P. J., Koka, B. R., & Pathak, S. (2006). The reification of absorptive capacity: A critical review and rejuvenation of the construct. *The Academy of Management Review*, 31(4), 833-863.
- Lane, P. J., Salk, J. E., & Lyles, M. A. (2001). Absorptive capacity, learning, and performance in international joint ventures. *Strategic Management Journal*, 22(12), 1139-1161.
- Liang, H., Saraf, N., Hu, Q., & Xue, Y. (2007). Assimilation of enterprise systems: The effect of institutional pressures and the mediating role of top management. *MIS Quarterly*, 31(1), 59-87.
- Liao, S.-h., Fei, W.-C., & Liu, C.-T. (2008). Relationships between knowledge inertia, organizational learning and organization innovation. *Technovation*, 28(4), 183-195.
- Lichtenthaler, U. (2009). Absorptive capacity, environmental turbulence and the complementarity of organizational learning processes. *The Academy of Management Journal*, 52(4), 822-846.
- Malhotra, A., Gosain, S., & Sawy, O. A. E. (2005). Absorptive capacity configurations in supply chains: Gearing for partner-enabled market knowledge creation. *MIS Quarterly*, 29(1), 145-187.
- Manimala, M. J., Jose, P. D., & Thomas, K. R. (2006). Organizational constraints on innovation and intrapreneurship: Insights from public sector. *Vikalpa*, 31(1), 49-60.
- Marabelli, M., & Newell, S. (2014). Knowing, power and materiality: A critical review and reconceptualization of absorptive capacity. *International Journal of Management Reviews*, 16(4), 479-499.
- Nohria, N., & Gulati, R. (1996). Is slack good or bad for innovation? *The Academy of Management Journal*, 39(5), 1245-1264.
- Nonaka, I., Toyama, R., & Byosiore, P. (2001). Theory of organizational knowledge creation: Understanding the dynamic process of creating knowledge. In M. Dierkes, A. B. Antal, J. Child, & I. Nonaka (Eds.), *Handbook of organizational learning and knowledge* (pp. 491-517). New York, NY: Oxford University Press.
- Nystrom, P. C., & Starbuck, W. H. (1984). To avoid organizational crises, unlearn. *Organizational Dynamics*, 12(4), 53-65.
- Oberoi, R. (2013). Deciphering the diverse nature of corporate governance in the Indian public sector: A study of public sector Bharat heavy electricals limited (BHEL) company. In D. Crowther, & G. Aras (Eds.), *The Governance of Risk* (pp. 203-233). Bingley, UK: Emerald Publishing Group
- Palaniswamy, R., & Frank, T. G. (2002). Oracle erp and network computing architecture: Implementation and performance. *Information Systems Management*, 19(2), 53-69.
- Pedro, R., Tiago, O., Björn, J., & Miguel, N. (2013). Differential effects on ERP post-adoption stages across Scandinavian and Iberian SMEs. *Journal of Global Information Management*, 21(3), 1-20.
- Pierce, J. L., & Delbecq, A. L. (1977). Organization structure, individual attitudes and innovation. *The Academy of Management Review*, 2(1), 27-37.
- Pinsonneault, A., & Kraemer, K. L. (1993). Survey research methodology in management information systems: An assessment. *Journal of Management Information Systems*, 10(2), 75-105.
- Purvis, R. L., Sambamurthy, V., & Zmud, R. W. (2001). The assimilation of knowledge platforms in organizations: An empirical investigation. *Organization Science*, 12(2), 117-135.

- Ramaswamy, K., & Renforth, W. (1996). Competitive intensity and technical efficiency in public sector firms: evidence from India. *International Journal of Public Sector Management*, 9(3), 4-17.
- Reimers, K. (2003). Implementing ERP systems in China. *Communications of the Association for Information Systems*, 11, 335-356.
- Rishi, B. J., & Goyal, D. P. (2008). Success factors in the implementation of strategic information systems: An empirical investigation of public sector undertakings in India. *Journal of Advances in Management Research*, 5(1), 46-55.
- Roberts, N., Galluch, P. S., Dinger, M., & Grover, V. (2012). Absorptive capacity and information systems research: Review, synthesis, and directions for future research. *MIS Quarterly*, 36(2), 625-648.
- Rogers, E. M. (1983). *Diffusion of innovations*. New York, NY: The Free Press.
- Robey, D., Ross, J. W., & Boudreau, M. (2002). Learning to implement enterprise systems: An exploratory study of the dialectics of change. *Journal of Management Information Systems*, 19(1), 17-46.
- Saraf, N., Liang, H., Xue, Y., & Hu, Q. (2013). How does organisational absorptive capacity matter in the assimilation of enterprise information systems? *Information Systems Journal*, 23(3), 245-267.
- Sharifirad, M. S. (2010). Relationship between knowledge inertia and organizational learning. *International Journal of Information Technology and Knowledge Management*, 2(2), 323-327.
- Sharma, S., Daniel, E. M., & Gray, C. (2012). Absorptive capacity and ERP implementation in Indian medium-sized Firms. *Journal of Global Information Management*, 20(4), 54-79.
- Singla, A. R., & Goyal, D. P. (2007). Success factors in ERP systems design implementation: An empirical investigation of the Indian industry. *International Journal of Business Information Systems*, 2(4), 444-464.
- Straub, D., Boudreau, M.-C., & Gefen, D. (2004). Validation guidelines for IS positivist research. *Communications of the Association for Information Systems*, 13, 380-427.
- Szulanski, G. (1996). Exploring internal stickiness: Impediments to the transfer of best practice within the firm. *Strategic Management Journal*, 17(S2), 27-43.
- Tan, J., & Peng, M. 2003. Organizational slack and firm performance during economic transitions: Two studies from an emerging economy. *Strategic Management Journal*, 24(13), 1249-1263.
- Teo, H.-H., Wan, W., Wang, X.-W., & Wei, K.-K. (2003). *Effects of absorptive capacity on organization predisposition towards information systems*. Paper presented at the 24th International Conference on Information Systems, Seattle, WA, USA.
- Todorova, G., & Durisin, B. (2007). Absorptive capacity: Valuing a reconceptualization. *The Academy of Management Review*, 32(3), 774-786.
- Tsang, E. W. K., & Zahra, S. A. (2008). Organizational unlearning. *Human Relations*, 61(10), 1435-1462.
- Uhlenbruck, K., Meyer, K. E., & Hitt, M. A. (2003). Organizational transformation in transition economies: Resource-based and organizational learning perspectives. *Journal of Management Studies*, 40(2), 257-282.
- Urbach, N., & Ahlemann, F. (2010). Structural equation modeling in information systems research using partial least squares. *Journal of Information Technology and Application*, 11(2), 5-40.

- Van Den Bosch, F. A. J., Volberda, H. W., & DeBoer, M. (1999). Coevolution of firm absorptive capacity and knowledge environment: Organizational forms and combinative capabilities. *Organization Science*, 10(5), 551-568.
- Vicente-Lorente, J. D. and Suárez-González, I. (2007). Ownership traits and downsizing behaviour: Evidence for the largest Spanish firms, 1990-1998. *Organization Studies*, 28(11), 1613-1638.
- Vasudeva, G., & Anand, J. (2011). Unpacking absorptive capacity: A study of knowledge utilization from alliance portfolios. *The Academy of Management Journal*, 54(3), 611-623.
- Vega-Jurado, J., Gutiérrez-Gracia, A., & Fernández-de-Lucio, I. (2008). Analyzing the determinants of firm's absorptive capacity: Beyond R&D. *R&D Management*, 38(4), 392-405.
- Volkoff, O., Elmes, M. B., & Strong, D. M. (2004). Enterprise systems, knowledge transfer and power users. *The Journal of Strategic Information Systems*, 13(4), 279-304.
- Wagner, W., & Antonucci, Y. L. (2009). The ImaginePA project: The first large-scale, public sector ERP implementation. *Information Systems Management*, 26(3), 275-284.
- Xu, Q., & Ma, Q. (2008). Determinants of ERP implementation knowledge transfer. *Information & Management*, 45(8), 528-539.
- Yang, K.-P., Chou, C., & Chiu, Y.-J. (2014). How unlearning affects radical innovation: The dynamics of social capital and slack resources. *Technological Forecasting and Social Change*, 87, 152-163.
- Zahra, S. A., Abdelgawad, S. G., & Tsang, E. W. K. (2011). Emerging multinationals venturing into developed economies: Implications for learning, unlearning, and entrepreneurial capability. *Journal of Management Inquiry*, 20(3), 323-330.
- Zahra, S. A., & George, G. (2002). Absorptive capacity: A review, reconceptualization, and extension. *The Academy of Management Review*, 27(2), 185-203.
- Zmud, R. W. (1982). Diffusion of modern software practices: Influence of centralization and formalization. *Management Science*, 28(12), 1421-1431.

About Author:



Prof. Madhavi Latha Nandi

Assistant Professor

Area: Information Technology and Systems Management

Education: B.E., Fellow (XIM, Bhubaneswar)

Email: madhavi@tapmi.edu.in

Telephone: +91-820-2701079

Teaching: IT in Business

Professional Activities:

- 6 years of professional experience in the area of Location Based Information Systems.
- Attended Doctoral Summer School in 2007 & 2008.
- Attended multiple conferences during the doctoral study and served as repertoire.
- Actively contributed to the organization of the 11th International Conference on Information Technology - 2008 at Xavier Institute of Management, Bhubaneswar.
- Actively contributed to the organization of the Conclave of CEOs and CFOs on the theme "Top priorities in the new regime & Growth strategies" - 2009 at Institute of Public Enterprise, Hyderabad.

Research:

Technology Diffusion in Organizations, Organizational Learning, Enterprise Systems, and Location Based Information Systems.

Publications:

Nandi, S., Nichols, P., & Nandi, M. L. (2013) "PINdex + 4: A Spatial identification system for points of interest in Indian cities" presented at 11th Symposium GIS Ostrava 2013 organized by VSB - Technical University of Ostrava, during 21st - 23rd Jan, 2013, Czech Republic.

http://gis.vsb.cz/GIS_Ostrava/GIS_Ova_2013/proceedings/papers/gis20135075e745333a9.pdf

Nandi, M. L. (2009).ERP Systems Implementation in organizations: Role of structural and contextual factors. Paper presented at the Doctoral Consortium of International Conference on Information Systems (ICIS), Biosphere 2, Arizona, U.S.A., 6-9 December, 2009.

Nandi, M. L., & Nayak, G. K. (2009). Role of organizational factors in ERP implementations. Poster paper presented at the Pacific Asia Conference on Information Systems (PACIS), 10-12 July 2009. <http://aisel.aisnet.org/pacis2009/109>

Nandi, M. L., & Nayak, G. K. (2008). Information systems management in public sector organizations. In B. S. Panda & A. Nayak (Eds.), ICIT 2008 (Proceedings of the 11th International Conference on Information Technology, Bhubaneswar, India, December 17-20, 2008) (pp. 289-294). Los Alamitos, CA: IEEE Computer Society.

Nandi, M. L., & Nayak, G. K. (2008). ERP implementation in a public sector organization: A dialectic perspective. In M. Jaiswal & R. K. Garg (Eds.), Enterprise systems and business process management: Global best practices (pp. 90-104). (ICES 2008: Proceedings of the International Conference on Enterprise Systems for Best Management Practices; Gurgaon, India, January 10-12, 2008.) New Delhi, India: Macmillan India.

Nandi, M. L., & Dash, D. P. (Ed) 2007. Research World. Vol. 4, 2007.

<http://www1.ximb.ac.in/RW.nsf/pages/RW4>

TAPMI WORKING PAPERS