Absorptive Capacity and ERP Implementation in Indian Medium-sized Firms

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ABSTRACT

Whilst absorptive capacity has been identified as an important contributor to the effective implementation of IT systems, previous studies have failed to explicitly consider the contribution of individual and organizational knowledge processes. Nine case studies of Enterprise Resource Planning (ERP) implementation were undertaken. The case studies were all undertaken in SMEs in a developing country since this is an important but under research area for the application of the concept of absorptive capacity. A particular implication of the findings is that firms lacking knowledge of IT implementation cannot simply seek this from external sources but

must develop internal organizational knowledge processes if their implementations of
IT systems are to be effective. This finding is particularly pertinent to the developing
country and SME context of this study, where low levels of experience within the firm
and the loss of experienced staff are found to impact on the development of absorptive
capacity.

Keywords: ERP; absorptive capacity; knowledge; developing countries; SMEs

INTRODUCTION

The past two decades have seen some of the most turbulent times for the world's developed and emerging economies. The ability of organizations to survive and prosper in dynamic environments has been linked to their ability to assimilate and apply new knowledge (Grant 1996; Nonaka and Takeuchi 1995; Spender 1996). Many organizations are deploying major IT implementations as part of their response to these turbulent times (Mia and Dutta 2010). These include enterprise-wide systems, such as enterprise resource planning (ERP) systems, intended to improve both efficiency and effectiveness of operations (Davenport 2000; Koh et al. 2011). Absorptive capacity has been identified as an important requirement for the effective implementation of such IT systems (Boynton et al. 1994; Chen and Ching 2004; Harrington and Guimaraes 2005). The concept of absorptive capacity considers that a firm's ability to innovate is based upon its ability to recognise the value of new knowledge and to assimilate and utilise this together with their existing knowledge in order to sustain and develop the organization, (Cohen and Levinthal 1990; Zahra and George 2002).

This study synthesises literature from the domains of individual and organizational knowledge and learning, absorptive capacity and IT systems implementation in order to develop a conceptual model. This model is used to frame an empirical investigation in the particular context of ERP adoption by medium-sized firms in India.

This study offers two important contributions. Firstly, the study combines a process perspective (Lane et al. 2006) and a dynamic capabilities perspective of absorptive capacity (Zahra and George 2002), providing a fuller understanding of the constituents of absorptive capacity and how they operate and interact. To date, with few exceptions (Lichtenthaler 2010), studies of absorptive capacity have tended to adopt one or other of these perspectives. Furthermore, previous process based studies have not explicitly recognised or explored distinctions between individual knowledge and organizational knowledge processes, despite these concepts being well accepted as distinct in extant literature in the domain of knowledge and learning (Polanyi 1967; Nonaka 1994; Grant 1996; Alavi and Leidner 2001). This study is therefore theory building in nature in that it seeks to extend the current theory of absorptive capacity.

Secondly, with just a limited number of exceptions (e.g. Gil et al. 2009; Park et al. 2007), previous studies of absorptive capacity in the IT domain have concentrated on the implementation of IT by large firms in developed countries. The majority of firms in developing countries are small and medium sized enterprises (SMEs). Studies of IT adoption and implementation by SMEs have shown that such firms may face particular challenges such as a lack of experienced IT staff and limited financial resources (Hamill and Gregory 1997; Levy and Powell 2008; Street and Meister 2004; Wilson et al. 2008). These challenges are likely to be exacerbated in a developing

country context, due to wider social and economic challenges (Adam and Urquhart 2007; Dangayach and Deshmukh 2006; Gholami et al. 2010; He 2004; Jarvenpaa and Leidner 2004). This suggests that medium-sized firms in a developing country context provide an appropriate context in which to undertake the empirical exploration of the theory extension that we seek to achieve. IT in developing countries is also an important area of study in its own right and hence the study also provides valuable empirical insights. Whilst the mechanisms that link the adoption of IT and increased organizational and national development are not simple (Avgerou 2003; Gholami et al. 2010; Li et al. 2010), both scholars and policy makers support the increased adoption of IT, particularly by SMEs (EU 2008; Milis 2008). It is important that the development of absorptive capacity of firms in developing economies is explored and understood, if they, and their national economies, are not to be *'locked out'* (Zahra and George 2002) of the developmental benefits that IT can offer.

The paper commences with consideration of previous literature addressing individual and organizational dimensions of knowledge and learning and the concept of organizational absorptive capacity. Dimensions of absorptive capacity identified in previous studies in both the IT and the wider management domain are then considered in terms of individual knowledge and organizational knowledge processes and synthesised into the conceptual model (Figure 1), which is used to guide the empirical stage of the study. The case study methodology adopted for the empirical investigation is then described. The findings of nine case studies undertaken are discussed in terms of the dimensions of absorptive capacity identified in the initial model and the interactions between these. The association between the elements of absorptive capacity and the development of a capability to implement ERP systems is

also discussed. The paper concludes with a discussion of the findings including the implications for SMEs in developing countries and practicing managers more widely. The limitations of the current study and opportunities for further research are also presented.

LITERATURE REVIEW

Much interest has been shown by both management academics and practising managers in the subject of knowledge. For example, discussions of tacit and explicit knowledge (Polanyi 1967; Nonaka 1994) and the changing nature of knowledge over its lifecycle and the implications this has for its management (Siemieniuch and Sinclair 2004; Birkinshaw and Sheehan 2002).

Others have sought to move the emphasis from the idea of knowledge as though it were a commodity that can be isolated, stored and transferred to others, to the notion that 'knowledge needs a knower'. For example, Alavi and Leidner (2001) characterise knowledge as the result of cognitive processing by individuals, which is triggered by the inflow of new stimuli, and hence assert that *'knowledge does not exist outside an agent (a knower)'* (p.109). Orlikowski (2002) furthers this idea by arguing that not only should a focus be placed on knowers, but that knowledge and action are inseparable, and it is necessary to consider the situated and context dependent activities of individuals when considering knowledge.

It is also recognised that the interaction of individuals with each other can give rise to both new individual knowledge and also to collective knowledge (Argyris and Schon 1976; Kolb 1985; Spender 1996; Kogut and Zander 1996; Weick 1991). Spender

(1996) observes that collective or organizational knowledge is greater than the summation of individual knowledge as it includes what occurs between individuals and that it is this collective knowledge that is most strategically powerful to organizations as it is relatively immobile and inimitable. Grant (1996) is less sympathetic to the notion of organizational knowledge, suggesting using the term will lead to reification. However he does recognise the existence of organizational processes through which organizations access and utilise the knowledge possessed by their staff. He notes that making such a distinction between individual knowledge and organizational knowledge processes directs attention to the mechanisms through which individuals interact in order to create and apply knowledge.

If both individual and organizational learning is characterised as changed responses, then there is need for an initial body of knowledge compared to which such a change can occur (Spender 1996). This leads to the notion of absorptive capacity, which Spender describes as similar to '*a computer's 'boot' program'* (p.64).

The Concept of Absorptive Capacity

The concept of absorptive capacity originated in development economics, where it refers to the ability of an economy to absorb and utilise external knowledge (Alder 1965). Cohen and Levinthal (1990) applied the concept to organizations and characterised it as *'prior knowledge permits the assimilation and exploitation of new knowledge'* (p.135). A more recent process-based perspective describes absorptive capacity as a firm's ability to utilize external knowledge through the sequential processes of exploratory, transformative and exploitative learning (Lane et al. 2006). Zahra and George (2002, p.186) link absorptive capacity and the strategic concept of dynamic capabilities (Eisenhardt and Martin 2000; Teece et al. 1997) by defining the

former as *'a set of organizational routines and processes by which firms acquire, assimilate, transform and exploit knowledge to produce dynamic organizational capability'*. This linking of absorptive capacity with dynamic capabilities recognises that absorptive capacity influences the creation of other organizational competencies, such as in the cases considered in this study, with the development and implementation of enterprise-wide IT systems. This study combines both a process and a dynamic capabilities perspective by combing a consideration of individual and organizational knowledge processes and IT implementation capability.

Considering the developing country context of this study, Silva and Figueroa (2002) find that firms in such contexts tend to draw on a wide range of sources of external knowledge, such as government, trade associations and educational organizations, when implementing IT systems. This suggests that the ability to locate sources of external knowledge and to effectively bring that knowledge into the organization will be particularly salient for firms in developing countries.

Dimensions of Organizational Absorptive Capacity

Previous studies are consistent in their recognition that organizational absorptive capacity is multidimensional in nature (Volberda et al. 2010). Analysis of extant studies of absorptive capacity in the IT domain identified five key dimensions. These five dimensions and their relationship to individual knowledge and organizational knowledge processes are discussed in turn below and are summarised in Table 1.

Take in Table 1 about here.

Individual Prior Knowledge

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1. Management Prior IT Knowledge

In one of the earliest studies of absorptive capacity in the IT domain, Boynton et al. (1994, p.299) find that *'managerial IT knowledge is a dominant factor in explaining high levels of IT use'*. This privileged position of management knowledge, compared to the knowledge of other individuals in the organization, is supported by other studies of absorptive capacity such as Liang et al. (2007) and Park et al. (2007), who show that organizational support, which includes management support, positively contributes to the absorptive capacity of individual IT users. Volberda et al (2010) state that managers can directly affect the absorptive capacity of their firms, particularly by embedding their knowledge and experience in the *'dominant logic'* (Bettis and Prahalad 1995) of the firm. However, whilst being clear about the influence of management knowledge, these authors do not identify or explore the processes through which this knowledge is enacted.

Studies of IT adoption in developing countries emphasise the importance of management support (e.g. Garcia-Sanchez and Perez-Bernal 2007; Soja 2008), with this being ranked as the most important key success factor in the former study. However, no attempt is made to explore the nature of that management support, for example the role of formal or experiential knowledge in that support and how it relates to other knowledge processes within the organization.

Organizational Knowledge Processes

Previous studies of absorptive capacity in the IT domain have associated a number of disparate routines or activities with the development of absorptive capacity. We propose that these can be more consistently understood as the organizational knowledge processes that Grant (1996) identifies as the means by which organizations

access and apply the knowledge of individuals. The dimensions of absorptive capacity indentified in previous studies of absorptive capacity in the IT domain are summarised in Table 1 and discussed below. These dimensions have not previously been brought together into a single model and hence the interactions between them have not previously been explored.

2. Vendor Selection

In addition to internal knowledge, organizations can draw on the knowledge of individuals external to the organization. These include hiring new staff, licensing, joint ventures, acquisitions, supply chain partners and the use of consultants (Fosfuri and Tribo 2008; Kim and Inkpen 2005; Ko et al. 2005; Lane et al. 2001; Malhotra et al. 2005). An important and commonly utilised source of external knowledge in the case of ERP implementation is the system vendor (Selnes and Sallis 2003; Ko et al. 2005; Vinding 2006; Park et al. 2007; Chen et al. 2009; Murovec and Prodan 2009).

It is important for the firm to be able to select an appropriate vendor. Appropriateness is likely to include the functionality, suitability for purpose and price of the software offered by the vendor. However, it should also include the ability of the organization to draw on, and benefit from, the knowledge of individuals within the vendor and from the vendor's organizational knowledge processes, that is, to work closely or collaborate with the vendor (Chen et al. 2009). The ability for the customer organization to share learning suggests an ability to draw on all or some of the elements of organizational absorptive capacity of the vendor. Whilst vendors may have considerable prior individual knowledge and well developed organizational knowledge processes, it may be difficult for the buying organization to access such knowledge.

Considering the developing country context of this study, Garcia-Sanchez and Perez-Bernal (2007) find that support from external consultants, such as vendors, is viewed as much more important in the implementation of IT systems by firms in developing economies than by firms in developed economies. This finding can be attributed to such firms recognising that they do not have sufficient knowledge within the firm, and seek to augment this from outside. This may be further exacerbated in the case of SMEs since Liang et al. (2007, p.67), assert *'ERP system vendors have more at stake by being attentive to their larger clients than their smaller ones'*.

3. Cross-functional Project Team

Cohen and Levinthal (1990, p.134), observe that absorptive capacity is increased by *'direct personal contacts across functions'* and encourage the use of *'cross-functional task forces and project teams'*. Van den Bosch et al. (1999) also assert that cross-divisional coordination within organizations should be associated with higher absorptive capacity, an observation which is echoed in later studies of absorptive capacity in the IT domain (Jansen et al. 2005; Harrington and Guimaraes 2005; Vinding 2006; Srivardhana and Pawlowski 2007). The use of cross-functional project teams is also consistent with much of the literature on IT project success, which identifies the importance of cross-functional project teams that comprise of individuals with different roles and therefore knowledge, including IT experts, business managers and system users (Nah et al. 2001; Umble et al. 2003; Ward et al. 2005; Peppard et al. 2007).

Nonaka and Takeuchi (1995) describe how individuals must have overlapping or 'redundancy' between their individual knowledge if they are going to be able to

integrate their non-overlapping knowledge. Hence whilst cross-functional teams benefit from individuals with different knowledge, they also require a degree of common knowledge between individuals to allow the integration of knowledge (Lindkvist 2005). Due to the limited number of staff with experience of large-scale IT development, firms in developing countries may not have the opportunity to develop this redundancy of knowledge, particularly if they are SMEs. The effective operation of cross-functional project teams may therefore be expected to be a particular challenge for firms in developing countries.

4. Internal Communication

In addition to the formation of a cross-functional project team, other members of an organization will be required to contribute their knowledge to the implementation of major IT systems, such as providers of information and users. Such widespread participation and combination of knowledge requires effective communication between those involved. As observed by Murovec and Prodan (2009, p.861), '*a broad and active network of internal and external relationships will…strengthen the organization's absorptive capacity*'. However, Szulanski (1996) recognises internal knowledge is '*sticky*' and warns that its transfer is not costless and instantaneous, rather it is a process that requires development and implementation.

In addition to combining the knowledge of different individuals communication is important since knowledge may enter or be created in the organization in one location, but needs to be applied in another location (Lenox and King 2004). Harrington and Guimaraes (2005, p.43) refer to this transfer of knowledge within the organization as communication channels, which they define as '*a means by which information is moved from one point to another within the social system*'.

5. Project Team and User Training

The absorptive capacity literature and studies of IT implementations stress the importance of training for project implementation staff and users of the system (e.g. Boynton et al. 1994; Mangematin and Nesta 1999; Vinding 2006; Deng et al. 2008; Camison and Fores 2010; Nah et al. 2001). For most large scale IT implementations, this training is likely to be provided by the system vendor or an external supplier (Park et al. 2007) and will hence represent a significant amount of external knowledge. Effective training will require a degree of shared or common knowledge and processes (Nonaka and Takeuchi 1995) between those undertaking the training and those receiving it. In the case of developing countries, Soja (2008) found that the low level of employee's knowledge about IT and business applications was the greatest difficulty facing firms implementing enterprise IT systems, a difficulty that was not elicited in comparable studies of IT implementations in developed countries.

Absorptive Capacity and IT Implementation Capability

Zahra and George (2002) characterise absorptive capacity as a dynamic organizational capability (Teece et al. 1997; Eisenhardt and Martin 2000), which they argue *'influences the firm's ability to create and deploy the knowledge necessary to build other organizational capabilities (e.g. marketing, distribution and production)'* (p.188). Previous studies have viewed the implementation of IT systems as an organizational capability (e.g. Feeny and Willcocks 1998; Ward and Peppard 2002). Combining these two views, it can be expected that the development of appropriate absorptive organizational capacity will influence a firm's ability to effectively implement IT systems, such as ERP systems. This view is supported by empirical studies of absorptive capacity in the IT domain that find a link between dimensions of

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absorptive capacity and IT use by organizations (Boynton et al. 1994) and with increased performance of IT users (Park et al. 2007). In particular, Harrington and Guimaraes (2005) link the development of absorptive capacity with IT implementation success. Following their work, in this study we adopt IT implementation success, as judged by on-time, on-budget implementation and the realisation of expected benefits (Nevo and Wade 2011) as a proxy for organizational capability development.

Again considering the developing country context of this study, the discussion of IT development and use by firms in developing countries is often viewed in terms of capacity building. Adam and Urquhart (2007 p.317) define capacity building as the development of *'…local human and organizational abilities to use IT to perform specific tasks…'*. This linking of capacity building to the development of individual and organizational IT capabilities, suggests that capacity building has the same end point as the model we propose in Figure 1, suggesting the development of absorptive capacity is highly relevant to capacity building. We would further venture that the knowledge process perspective we adopt adds to an understanding of of capacity building by demonstrating the processes through which the human and organizational IT capabilities that result from capacity development can be developed.

The five dimensions of absorptive capacity identified in extant literature and the link to organizational capability development discussed above, are incorporated into the conceptual model shown in Figure 1.

Take in Figure 1 about here.

The conceptual model proposed in Figure 1 is used to guide the empirical phase of the study.

RESEARCH METHODOLOGY

Recognising the practice and context dependence of individual knowledge (Orlikowski 2002) and the social aspects of organizational knowledge processes (Grant 1996; Alavi and Leidner 2001) on which we assert organizational absorptive capacity is based, a case study approach was adopted for the study (Eisenhardt 1989; Hoskisson et al. 1999). To date the majority of studies of absorptive capacity have adopted a positivist quantitative approach (e.g. Camison and Fores 2010; Park et al. 2007). However, such studies have the limitation that they utilise narrowly defined and predetermined items and scales which often rely on proxy variables. The qualitative approach adopted in this study allows an exploration of the complex dimensions of absorptive capacity identified in Figure 1 (Benbast et al. 1987). Such an approach also respects the understanding and experience of the senior managers that participated in the study, by allowing them to tell their own narratives or *epilogues* (Dibbern et al. 2008, p.343), rather than ascribing meaning via predetermined scales.

Sampling and Data Collection

A multiple case study approach was adopted in order to increase the analytical generalisation of the study findings (Yin 2003). As stated previously, the context of the study is enterprises in a developing country due to the dependence of firms in this context on the identification of sources of external knowledge and effectively bringing that knowledge into the firm (Silva and Figueroa 2002). In order to provide a degree of consistency between cases (analytic replication) all firms were drawn from the

manufacturing sector. This sector has faced a number of significant challenges over the last decade, including the reduction in government protectionism and the rise of other low cost manufacturing centres such as China and South East Asia (Dangayach and Deshmukh 2006; Sharma an Ali 2010). Reports suggest that at 17% of national GDP, manufacturing in India is much below its potential and manufacturing firms should look for means to improve their productivity (National Manufacturing Competency Council 2006). This performance deficit suggests that such firms would benefit from developing absorptive capacity but that they may also be having problems in doing this. Again, in order to ensure a degree of replication between cases, all firms studied were medium sized (between 150 and 300 employees). SMEs are an important part of the manufacturing sector in India, producing approximately 40% of manufacturing output of India (Sharma and Ali 2010). However, like the manufacturing sector in general, small and medium sized manufacturers in India are thought to be underperforming compared to larger manufacturing firms (National Manufacturing Competency Council 2006), suggesting they are highly relevant to a study of the development of absorptive capacity and organizational IT capability development. Despite the challenges faced by manufacturing SMEs in India, it should also be recognised that these firms enjoy some advantages. The Indian economy, even with the onset of the global downturn, is more dynamic than more developed economies such as that of the UK, which only managed a growth of less than one tenth that of India in 2008 (World Bank 2010). Furthermore, India has placed a great emphasis on indigenous technology and management education compared to other rapidly growing nations (Thatchenkery et al. 2004) resulting in a pool of individuals with high levels of individual formal knowledge.

Nine case studies were undertaken. This allowed a balance between data overload and the analytical generalisation sought by the study. The appropriateness of nine cases was demonstrated by *'saturation'* and *'consistent regularities'* being achieved during data analysis (Miles and Huberman 1994, p.62).

Within the majority of the case study organizations, interviews were carried out with three individuals who had played a key role in the ERP implementation. In most cases these were: the Chairman, CEO or other senior manager; the IT Director or Manager, who in most cases also acted as the project manager for the ERP implementation, and a business executive that represented users within the organization. As shown in Table 2, a total of 27 interviews, which lasted from one to four hours, were undertaken across the nine case study firms.

Take in Table 2 about here.

Consistent with other case-based research, interviews were guided by a semi-structured interview schedule derived from the conceptual model shown in Figure 1. Other sources of data such as; internal documentary data (internal project briefs, implementation progress reports, internal memos), site observations and field notes were also collected and included in the analysis (Denzin and Lincoln 1998).

Whilst the researchers reflected on each case study as it was undertaken, all nine case studies were completed before formal analysis was undertaken. Whilst it is recognised that this does not allow the iterative or recursive approach included in methods such as grounded theory (Strauss and Corbin 1990), this was a pragmatic requirement arising from undertaking data collection overseas.

Data Analysis

The interviews were recorded and fully transcribed. Interviews were conducted in the local language and transcriptions were translated into English. The translated transcripts were coded using tabular layouts in a word processing package. Initial codes were taken as the five dimensions shown in the model (Figure 1) with an additional code relating to the outcome of the implementation. The predefined coding derived from the operationalized model means that the study and the findings presented, for example in Figure 2, are largely deductive in nature (Miles and Huberman 1994). Each of the predefined initial codes was broken down into finer grained codes, as shown in the example of the coding scheme included in the Appendix. In addition to the predefined codes, an opportunity for additional codes, and reformulation of initial codes was allowed for during analysis. Particular note was taken of data that provided evidence of linkages between coded data (Dey 1993). These linkages allowed inter-relationships to be identified and understood, rather than relying on simple associations between variables (Miles and Huberman 1994). This was an important aspect of coding given the study's interest in the interactions between individual knowledge and organizational knowledge processes. These codes were identified with a 'connection number' as shown in Figure 2 (see also the coding table in the Appendix). Coding was undertaken by one of the researchers and then independently assessed by the other two researchers involved. Inter-coder reliability was high, but where differences occurred these could be resolved by looking at the text in its fuller context.

Coding was first undertaken within each of the nine cases. The first case was then used to refine the original model (Figure 1) based on the linkages identified in order to produce an empirical model (Figure 2). This was then tested by considering each of

the other eight case studies in turn, reworking or qualifying the empirical model where necessary. Similar to the coding process, the derivation of the empirical model was undertaken by one researcher and then independently assessed by the other two, who sought to identify alternative relationships and explanations. Where alternatives were identified, all three researchers returned to the case data to gain clarity and resolve ambiguities.

Internal and External Validity

Qualitative methodologies are often criticised for their potential lack of validity. As described above, internal validity was increased by interviewing and combining data from multiple interviewees with differing roles in their firm's implementation process and, where possible augmented by the additional sources of data collected such as site observations and internal documents. Internal validity was also increased by using multiple coders in the data analysis process. External validity is concerned with the generalisability of the findings of the study. Whilst the study did not intend to achieve statistical generalisation, theoretical generalisation was achieved by undertaking multiple case studies (Yin 2003).

EMPIRICAL FINDINGS

A summary of the key features of the ERP implementation and the dimensions of absorptive capacity in each firm is provided in Table 3.

Take in Table 3 about here.

The inter-relationships between the dimensions of absorptive capacity suggested by analysis of the cases are presented in Figure 2. The connections identified in Figure 2 are discussed below and summarised with representative supporting data in Table 4.

Take in Figure 2 about here.

Considering connection 1 in Figure 2, in firms 1-5 managers had higher levels of both initial formal business and IT qualifications and experiential knowledge than firms 6-9. The experiential knowledge in firms 1-5 came from a range of different sources, including previous implementation attempt (firm 1), a familiarity with the role of project management techniques (firm 2), the implementation of ERP in other firms that the manager had substantial interactions with (firm 3 and 5) and the influence and experience from a parent company (firm 4). In all of these five firms, managers recognised the importance of the four organizational knowledge processes considered and sought to ensure these were established and operated effectively.

In firms 6-9, with lower levels of formal qualifications and no prior experience, the four organizational knowledge processes were either not established or were not operationalized effectively, for example, in all four firms, interviewees described low levels of internal communication leading to lack of clarity about the intention of the ERP implementation and uncertainty amongst staff about progress. In the case of firm 9, rather than viewing management's role as sharing knowledge, they were viewed as detached decision makers:

> *Top management role is to give orders...they do not need to come to meetings*
> *or to be involved...*

Many previous studies have identified the importance of top management support in the effective implementation of ERP systems (e.g. Finney and Corbett 2007; Nah et al. 2001). However, adopting the knowledge-based perspective of this study, suggests that this support is effective when those managers have prior experience and knowledge of, or highly relevant to, ERP implementation on which to base their support, that is it should be 'knowledge-based support'.

As represented by connection 1 in Figure 2, this prior knowledge of management appears to operate through recognising the importance of establishing effective organizational knowledge processes. From the case study findings, the prior knowledge of management appears to influence selection of a vendor with which the firm can collaborate, the formation of the project team, internal communication and the training of staff. Firms 1–5 all selected their vendors based upon their prior experience with similar sized firms or with firms in the same sector. By selecting a well-known international vendor, Firm 6 appeared to recognise the importance of vendor knowledge and prior experience, but when their vendor proposed the wrong version of software, their management, including the IT manager, were not able to recognise and challenge this selection, due to their own lack of formal and experiential knowledge.

Firms 7–9 all stressed how their main criterion for the choice of vendor was price. This resulted in these three firms selecting local vendors, whilst firms 1–6 all used major international vendors. It would be wrong to conclude from a limited study such as this that, large international vendors are important for IT implementation success in developing countries. However, particularly, firms 1–5 were able to benefit from the greater prior knowledge that the major vendors had from working with similar sized

firms or with firms in the same sector. In contrast, the local vendors had more limited experience which was demonstrated by them all adopting a step-by-step approach to implementation, as opposed to the 'big-bang' approach favoured by the international vendors. The Senior Business Manager in firm 9 confirmed that the step-by-step approach was often because the local vendor was learning alongside the firm, rather than providing external knowledge to them:

> *We did not know what is inside the package...so basically all of us were learning. In 1999 ERP was new even to the vendor's team. People did not know much so all of us were trying to learn by trial and error.*

Where cross-functional project teams were established (firms 1 – 6), individuals from the vendor worked alongside these teams, providing an opportunity to integrate their external knowledge with that of staff in the organization (connection 2 in Figure 2). Whilst the vendors also undertook activities in the firms that did not form cross-functional teams (firms 7–9), they interacted with fewer staff in the case study firms and staff with a more limited range of prior knowledge, resulting in less opportunity for knowledge integration between individuals within and external to the firms.

As represented by connection 3 in Figure 2, formation of a cross-functional project team can be an important driver of internal communication. Not only does it signal to other staff in the organization that this is a firm-wide initiative, it also allows the sharing of specialised knowledge between project staff and staff from functional areas. However, it was recognised by managers with prior knowledge, that formation of such teams is not sufficient of itself. Managers in firms 1–5 therefore instituted a number of additional knowledge processes to communicate information about the project within their organizations, which included both mechanisms to inform staff

(notice boards, newsletters) and to gather views and knowledge from staff (meetings, workshops). These firms were therefore able to benefit from the internal exchange of knowledge amongst staff.

Finally, firms 1–6 all recognised the importance of training for both the project team and for the users of the system. All of these firms used the vendor as a source of training (connection 4 in Figure 2), demonstrating that this is an important source of external knowledge and that training sessions are an effective organizational process for transferring that external knowledge into the firm. It was recognised that it was necessary for the firms to ensure that staff had relevant prior knowledge about IT and business functions to be able to absorb and utilise the training provided, as described by the Assistant Manager in firm 6:

> *...I can say two things are very important related to training. The first thing is when the training is provided. Ideally it has to be given in phases and secondly you need to find out the absorption of knowledge and learning by users from the training - to see how much of the knowledge they can apply to the real ERP implementation.*

As discussed in the literature review section, and depicted by connection 5 in Figure 2, Zahra and George (2002), link absorptive capacity to a firm's ability to build other organizational capabilities, characterised in this study as the effective implementation of ERP systems. Firms 1–4 implemented their ERP systems according to the planned schedule and budget and had realised the expected benefits from the systems. For example, according to the ERP Implementation Manager in firm 1:

...inventory costs have been significantly reduced after implementing ERP and labour costs have been reduced, as the production of seats that was completed in two shifts can now be completed in one shift.

In addition to reducing inventory and order processing time and improving management information, firm 4, who manufactures medicines, was using their ERP system to maintain records and track production details, as described by the Finance Executive:

In the pharmaceutical industry, tracking is very important. Suppose a batch of medicine needs to be tracked then information on all the raw materials can be traced, how it was manufactured, how it was purchased etc...our ERP gives us this.

In comparison firm 5 took longer to implement their systems than planned. They opted for a step-by-step roll out strategy, due to concern about their available resources, which contributed to the longer implementation time than firms 1–4. Despite these increased timescales, the firm considered their ERP implementation successful.

In contrast, firm 6 adopted a 'big bang' approach to implementation, but the implementation took significantly longer, and hence was more costly, than planned. Despite the firm's recognition that the implementation process had not been successful when compared to the original plans, their EPP system was in use and they were deriving benefits.

In firms 7, 8 and 9 ERP implementation is not considered successful by those interviewed. In firm 8, implementation was stopped after almost a year, as described by the Head of IT:

> *ERP started in 2001 but was stopped in 2002 after spending almost one year. It was a total failure. We gave 25% of the cost to the implementation partners but they left us in the middle. We could not do anything because you know Indian laws and we did not want to spend time in courts...*

Firm 9 has also failed to fully deploy their ERP system, despite spending five years on the implementation.

The foregoing discussion provides support for the connection between organizational absorptive capacity and a capability to effectively implement ERP systems: firms 1 – 5, which demonstrated prior management knowledge and experience, established the organizational knowledge processes identified in Figure 2 also demonstrated timely and effective implementation of their ERP systems. In contrast, firms 7 – 9, that had limited prior management knowledge and not prior management experience, did not effectively establish organizational knowledge processes, were judged as unsuccessful by the staff interviewed. In firm 6, those interviewed considered the implementation as successful because they were able to identify performance advantages directly attributable to ERP, however, the implementation took significantly longer, and cost more, than planned.

Two firms provided evidence of feedback from the development of absorptive capacity and the capability to implement ERP to the acquisition of individual knowledge (connection 6 in Figure 2). Firms 1 and 8 had both had previous attempts

at implementing ERP systems. The managers in both these firms gained individual experience from these previous implementation attempts. This experience had in turn shaped their development of organizational knowledge processes for their subsequent ERP implementations. For example, firm 1 had previously sought to implement a system from a local vendor that required considerable customisation. The managers interviewed in this firm were clear that they had learnt from this experience and that for their second implementation they would use that learning to identify a system that required little customisation.

This study did not provide evidence of direct feedback to organizational knowledge processes (connection 7). A focus on organizational knowledge processes that seek to capture organizational memory (El Sawy et al. 1996; Srivardhana and Pawlowski 2007) may have identified evidence of such direct feedback. However, given a key tenet of this study is that knowledge requires a knower, and the findings that support this by suggesting the importance of the knowledge of managers, we believe that the main effect of feedback will operate through the increased knowledge of key individuals within the firm, who in turn can implement effective organizational knowledge processes in order to share their increased individual knowledge. We therefore suggest that the feedback from implementation to subsequent organizational knowledge processes is indirect and therefore is shown in Figure 2 by a dashed line.

Take in Table 4 about here.

CONCLUSION

Whilst absorptive capacity has been identified as an important contributor to the effective adoption of IT systems, previous studies have failed to explicitly consider the contribution of individual knowledge and organizational knowledge processes and the interactions between these in the development of absorptive capacity. The research reported in this paper has addressed this omission.

A major contribution of this study is the linking of a process perspective of absorptive capacity (Lane et al. 2006) with that of a dynamic capabilities theory (Zahra and George 2002). In particular, this study provides an explicit recognition of the interactions between individual knowledge and organizational knowledge processes in the development of absorptive capacity (Figure 3). This has allowed notions from the knowledge and learning literature, such as the importance of an individual knower (Orlikowski 2002; Alavi and Leidner 2001) and the need to develop organizational processes that can allow access, combination and utilisation of the knowledge of individuals (Grant 1996), to be explicitly recognised in the development of absorptive capacity. Such an unique focus on knowledge processes and how these interact addresses the limitation of previous studies identified by Volberda et al. (2010, p.937) *'Ignorance of process dimensions…most empirical studies do not carefully address important processes that influence the viability of absorptive capacity'*.

This study shows that the prior knowledge of senior management was particularly important in the development of organizational absorptive capacity, being central to the development of the organizational knowledge processes studied. Previous studies of IT implementation suggest that senior management support is sufficient for success, but this study shows that it is informed or knowledgeable support that is

required. This finding is consistent with extant studies from the absorptive capacity domain (Lichtenthaler 2010) but extends such prior studies by showing how that knowledge influences the development of organizational knowledge processes that are important constituents of absorptive capacity.

Implications for a developing country context

The developing country context of this study returns to the origins of the concept of absorptive capacity in development economics and complements the existing body of studies of IT in developing countries (e.g. Avgerou and Walsham 2000; Silva and Figueroa 2002; Walsham et al. 2007; Puri 2007; Yao et al. 2009). This study focuses on indigenous, private sector firms, which Prasad and Heales (2010) observe play a critical role in IT-related economic growth in developing countries and that Adam and Urquhart (2007) suggest are under researched.

India has taken a different route to development than other rapidly growing nations by placing a great emphasis on indigenous technology and management education, which was demonstrated by the high level of formal qualifications of the senior staff in the case study organizations (Table 4) (Thatchenkery et al. 2004; Biswas 2004; Narasimha 2008; Hung 2009). However, the case study firms also demonstrate that SMEs in India still face the challenges of other developing nations, such as a shortage of experienced labour causing experienced staff to be highly sought after and hence highly mobile (firm 6) (Dibbern et al. 2008) and many other staff groups having low starting levels of IT literacy (firm 4) (Jarvenpaa and Leidner 2004). These observations accord with Adam and Urquhart's (2007, p.330) findings that '*IT capacity building is a pressing issue in developing countries*'.

The challenges in developing the dimensions of organizational absorptive capacity explored in this study suggest that firms in developing countries may face the potential of a vicious cycle of limited absorptive capacity leading to poor implementation and hence an inability to gain knowledge or experience of successful implementation. Firms may therefore be effectively 'locked out' (Zahra and George 2002) of successful system implementation, with implications for both firm-level performance and the macro-economic performance of developing countries.

The limited availability of individuals with relevant prior knowledge and experience will also reduce the opportunity for firms to learn from other sources, such as other firms, professional networks and consultants (Fosfuri and Tribo 2008; Ko et al. 2005; Zahra and George 2002). For example, firm 3 augmented its formal training by visiting other firms that had implemented ERP systems.

One important external source of knowledge in IT implementations in developing countries identified in previous studies is that of the system vendor (Park et al. 2007; Chen et al. 2009). Our study extends this view by suggesting that the selection of an appropriate vendor may be more difficult in a developing country context, even in a country such as India which has sought to build a reputation for the provision of high quality IT services (Lahiri and Kedia 2011). It has been observed, rather than seeking to support local indigenous businesses, '*the majority of the software and services produced in India are for the export market*' (Narayanan and Bhat 2011). Hence whilst the world class standard of many larger Indian IT suppliers, which are often derived from India's powerful Business Houses (Lall 1982), is demonstrated by their

provision of software and services to developed countries. This focus on external markets may result in less effort being expended in supporting local firms. As demonstrated in this study, if smaller firms in developing countries cannot afford the services of larger, more experienced vendors, they will select smaller, local vendors who are often learning alongside the customer, hence limiting this important source of external knowledge.

The significant impact of senior management knowledge on the development of organizational absorptive capacity identified in this study may also be particularly pertinent in the Indian context of this study. Previous studies of cultural orientations have identified Indians as high on power distance measure (Hofstede 1990). In cultures with high power distance, there is a great respect for authority and senior managers are assumed to '*possess wisdom and are automatically esteemed*' (Marcus and Gould 2000, p.36). In such settings subordinates will assume their senior managers have prior knowledge and will be reluctant to be seen to identify limitations or gaps in that knowledge. Interestingly, high power distance has been related to lower levels of per capita GDP (Marcus and Gould 2000), hence the significant role of the knowledge of senior management in the effective implementation of ERP systems identified in this study may be acting as a constraint in other developing countries, as well as in the Indian context.

Implications for practising managers

The model developed in this study (Figure 2) identifies five dimensions that should be addressed in order to develop absorptive capacity that can lead to an ERP implementation capability.

Given the central role of the prior knowledge of senior managers in increasing organizational absorptive capacity shown by this study, managers should seek to increase their own knowledge and experience of both IT and business aspects of implementation. Again, given the connection of this knowledge to other aspects of organizational absorptive capacity, managers should seek to initiate this accumulation of knowledge before implementation, for example, attending awareness and training events and networking with other senior managers from similar firms from whom they can benefit from the spillover effects identified in this study.

In addition to gaining personal knowledge, managers should apply this knowledge to the establishment of the organizational knowledge processes identified in Figure 2. As has been discussed in prior literature and demonstrated in the case studies, such processes are the means by which a range of individuals in the organization can integrate their different knowledge, transmit knowledge to where it is needed and apply their knowledge in practice (Grant 1996; Orlikowski 2002).

LIMITATIONS AND OPPORTUNITIES FOR FURTHER RESEARCH

Like all studies, the limitations of this research should be recognised. As discussed in the methodology section, a qualitative approach was adopted in order to explore the complex phenomenon of organizational absorptive capacity and its influence on ERP implementation. As with all such qualitative approaches, the intention is to achieve analytical generalisation, rather than statistical generalisation, and hence the findings cannot be generalised without further research.

Consistent with previous literature that identifies the strong effect managers have on knowledge-related-processes (Volberda et al. 2010), this study focussed on the effects of individual knowledge of managers. It is recognised that the individual knowledge of other groups, such as users and vendors, may also influence the operation of the organizational knowledge processes studied, and hence it is suggested that further research is undertaken to explore the influence of such individual knowledge.

In particular, the study focussed on medium sized manufacturing firms in India. Whilst we believe that the findings are consistent with other developing country contexts, this should be the subject of further study. In particular, whilst limited resources and prior experience may typify developing countries, responses to those constraints may vary across countries according to local customs and culture (Jarvenpaa and Leidner 2004; Thatchenkery et al. 2004), leading to different ways in which firms seek to increase their organizational absorptive capacity. Similarly, whilst small firms often face similar challenges to medium sized companies, and hence are often treated as one group in research studies, there are likely to be differences in how small companies are able to develop their absorptive capacity. For example, a small firm may not be able to have IT knowledge within the organization limiting its ability to have prior internal knowledge to draw on. Studies should be undertaken to understand how such small firms can develop the requisite absorptive capacity without the internal prior knowledge that has been shown here to be so important in drawing together the other dimensions identified in Figure 2.

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APPENDIX: Table A1: Example of Coding: Cross Functional Project Team

Top-level Code (from Fig 2)	Sub-codes	Illustrative Data
Cross functional project team	*Cross functional team formation*	*The team members were only involved in the ERP project and did not perform any other office work. Their commitment made implementation finish on time.* **ERP Implementation Manager, firm 1.** *We created a full time working team and it worked for us. One person was volunteered from each department for the ERP team. It was more of a cross-functional team rather than IT team.* **Chairman and Managing Director, firm 3**
	Lack or absence of cross functional team formation	*Our Head of IT is capable of handling it on his own...* **Director, firm 8** *Basically we have not formed a team….. Most of the time people would say this is an IT project, we cannot help you...our work is already pending, we cannot spend time on it now.* **Manager, firm 9**
	Cross functional team activities	*The top management of this firm emphasised the importance of project planning. Thus even small project activities were thought of and time was spent in planning and assigning responsibilities to ERP team members.* **ERP Implementation Manager, firm 1**
	Lack or absence of cross functional team activities	*All the planning was done by the Directors of the organization, but mainly about ERP costs like computer costs, software costs, vendor costs etc. No detailed plans were made about ERP project activities. We all wanted to start the process of loading the software.* **Advisor (technical), firm 7**
	Connection 1 *Linkage of management knowledge code to cross functional team code*	*The initiative was taken by top management….for example they reassigned the work of the ERP team members so they could focus on the implementation.* **ERP Implementation Manager, firm 1.** *I have told him [the Managing Director] again and again to form an ERP team but he will not listen.* **Manager IT, firm 7**

Figure 1: Conceptual model

Individual knowledge

1. **Management prior IT knowledge** (e.g. Boynton et al 1994; Lennox and King, 2004; Vinding, 2006; Liang et al, 2007)

Organisational knowledge Processes

2. **Vendor selection** (Vinding, 2006; Ko et al, 2005; Park et al, 2007; Murovec and Prodan, 2009)

3. **Cross-functional project teams** (Van den Bosch et al, 1999; Cohen and Levinthal, 1990; Harrington and Guimaraes, 2005)

4. **Internal communication** (Fosfuri and Tribo, 2007; Szulanski, 1996; Lennox and King, 2004)

5. **Project team and user training** (Murovec and Prodan, 2009; Mangematin and Nesta, 1999; Deng et al, 2008; Camison and Fores, 2009)

Organizational absorptive capacity

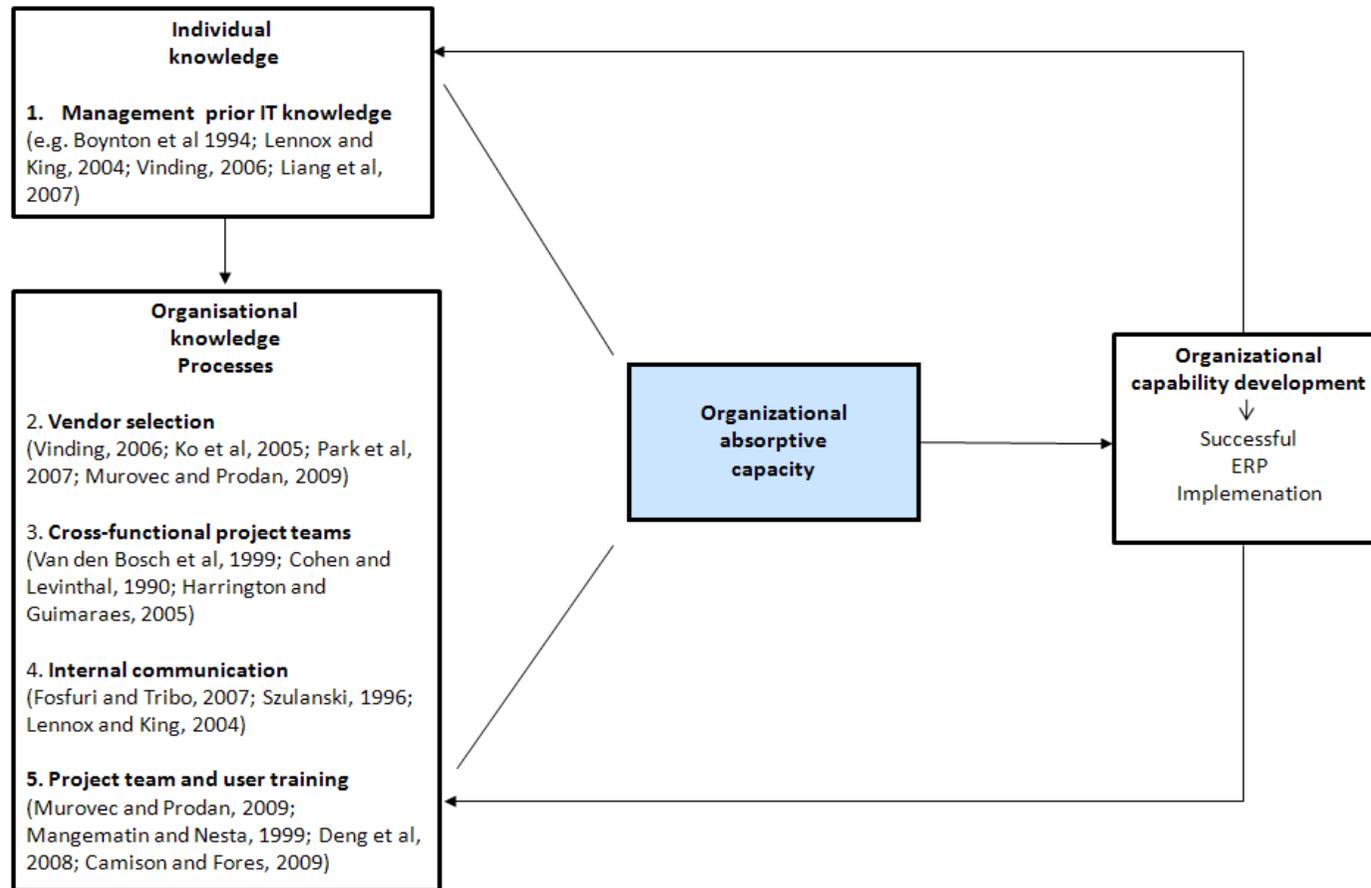Organizational capability development ↓ Successful ERP Implemenation

Figure 2: Empirical model showing the inter-relationships between dimensions of organizational absorptive capacity
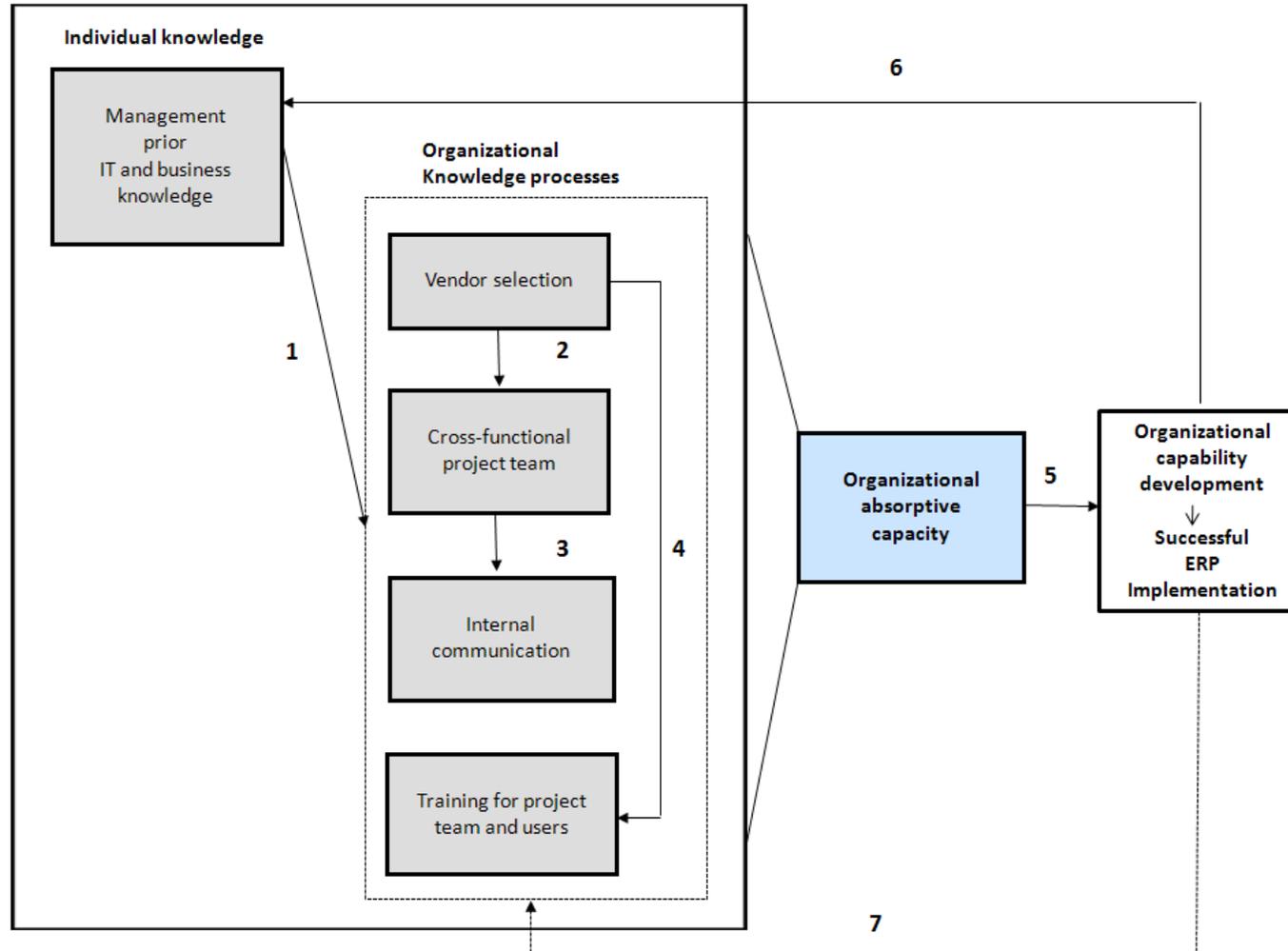
Table 1: Connections between Conceptual and Operationalized Model

Concepts from knowledge and learning literature	Dimension in conceptual Model	Example Occurrence in Extant Literature	Other Sources
Individual knowledge Based on individual knowers (Polanyi 1967; Alavi and Leidner 2001) Rooted in context and practice (Orlikowski 2002; Nonaka 1994)	Management prior knowledge	'*managerial IT knowledge is a dominant factor in explaining high-levels of IT use*' Boynton et al. (1994, p.299)	Lennox and King (2004); Harrington and Guimaraes (2005); Vinding (2006); Park et al. (2007); Liang et al. (2007)
Organizational knowledge processes Through which organizations access the knowledge of their staff (Argyris and Schon 1976; Grant 1996) Within and across the boundary of the firm (Nonaka and Takeuchi 1995; Spender 1996)	Vendor selection	'*firms that have developed closer relationships with vertically related actors such as customers and suppliers….do significantly better on innovative performance*' Vinding (2006, p.513)	Selnes and Sallis (2003); Ko et al. (2005); Park et al. (2007); Chen et al. (2009); Murovec and Prodan (2009)
	Cross functional project team	'*Cohen and Levinthal (1990) also stressed the importance of cross-functional interfaces such as relationships between functional areas, personal contact across functions…*' (Van den Bosch et al. 1999, p.557)	Cohen and Levinthal (1990); Jansen et al. 2005; Harrington and Guimaraes (2005); Vinding (2006)
	Internal communication	'*knowledge once inside the organization must be shared across the firm's members*' Fosfuri and Tribo (2007, p.178)	Szulanski (1996); Lennox and King (2004); Harrington and Guimaraes (2005); Park et al. (2007); Murovec and Prodan (2009)
	Training for project team and users	'*existing empirical studies [of absorptive capacity]…neglect the importance of the organization's later investments in training*' Murovec and Prodan (2009, p.861)	Boynton et al. (1994); Mangematin and Nesta (1999); Vinding (2006); Park et al. (2007); Deng et al. (2008); Camison and Fores (2010)

Table 2: Case study firms and interviewees

Case	Number of employees	Industry	Interviewees	Interview location
Firm 1	300	Car parts	3	Haryana, India
Firm 2	200	Automobiles interiors	3	Haryana, India
Firm 3	150	Car steering system	2	Haryana, India
Firm 4	300	Medicines	3	Uttar Pradesh, India
Firm 5	125	Clothing	3	Haryana, India
Firm 6	300	Cable	3	Uttar Pradesh, India
Firm 7	200	Clothing	4	Haryana, India
Firm 8	180	Cable	3	Haryana, India
Firm 9	270	Sponge iron	3	Delhi, India
Total			27	

Table 3: Summary ERP Implementation Characteristics (shading relates to similar levels of perceived success)

Firm	1	2	3	4	5	6	7	8	9
Year implementation	2001 (2nd attempt)	2006	2002	2001	2000	2004	2005	2001-02 (failed) 2004 (2nd attempt)	1999
Implementation duration	6 months	8 months	10 months	9 months	15 months	2 years – significantly longer than planned	Not completed	Failure – followed by 2nd attempt	Unsuccessful implementation
Estimated cost	£72,000	£96,000	£72,000	£90,000	£48,000	£100,000 – over budget	£12,000	£18,000	£12,000
Implementation	Big bang	Big bang	Big bang	Big bang	Step-by-step	Big bang – but wrong software chosen	Step-by-step	Step-by-step	Step-by-step
ERP vendor	BAAN	SAP	Oracle	Movex	MFG/Pro	BAAN	Orega (local ERP vendor)	Local vendor (failed) followed by in-house	Alysha Software (local)
Formal Education of senior mgmt	Masters level IT + management	Masters level IT + management	Masters level IT + management	Masters level IT + management	Masters level IT + management	none	Bachelors Management	Bachelors IT + management	Bachelors IT
Prior practical knowledge of management	Previous ERP implementation	Project mgmt experience	Chairman on Board of firm with ERP implementation	German parent has ERP	Limited learning from firm in another sector	No prior experience	No prior experience	No prior experience	No prior experience
Vendor prior knowledge	Experience with similar sized companies	Experience with similar processes	Experience with similar sized firms	Knowledge of pharmaceutical sector	Experience in different sector	Selection based mainly on price	Selection based mainly on price	In-house solution	Selection based mainly on price
Cross-functional team	Dedicated cross-functional team	Cross-functional team	Dedicated cross-functional team	Cross-functional team	Cross-functional team	Cross-functional team – but staff turnover	IT team	IT team	IT team
Internal communication	Range of communication – inc 2-way	Range of communication – inc 2-way	Range of communication – inc 2-way	Range of communication – inc 2-way	Range of communication – inc 2-way	Limited range and amount of communication	Very limited communication	Very limited communication	Very limited communication
Training	Structured training – external input	Structured training – external input	Structured training – external input	Structured training – external input	Structured training – external input	Structured training – external input	Limited training – internal provision	Limited training – internal provision	Limited training – internal provision

Table 4: Connections between Dimensions of Absorptive Capacity

Number of Connection in Figure	Nature of Connection	Evidence derived from Cross Case Comparison	Illustrative Data
1	Influence of management prior IT and business knowledge on organizational knowledge processes	Firms 1-5, where managers had higher levels of both formal business and IT qualifications and experiential knowledge - either from previous implementation attempt (firm 1), project management (firm 2) other firms (firm 3 and 5) or parent company (firm 4). These firms: • Selected an international vendor with relevant prior experience • Established a cross functional team • Implemented a range of internal communications including 2-way communication • Provided structured training In firms 7-9, with lower levels of formal qualifications and no prior experience, local vendors with limited experience were selected. Cross functional teams, internal communication and structured training were not established or provided. Firm 6, with no formal qualifications and no prior experience, hired an international vendor but allowed selection of wrong software. Also it implemented limited internal communication and	*The initiative was taken by top management….for example they reassigned the work of the ERP team members so they could focus on the implementation.* **ERP Implementation Manager, firm 1.** *We knew there was a 100 per cent chance of having a failed ERP if the wrong selection of a vendor was made...so we spent one month on it.* **IT Manager, firm 4.** *In companies where the IT Manager or top management does not have enough knowledge [about customization], they will say OK and they will start implementing. Then they will find out the real impact of customization...* **IT Manager, firm 4.** *Our Chairman was also more interested in going for the same ERP as XXX, because it had given good results to them.* **IT Manager firm 5** *I have told him [the Managing Director] again and again to form an ERP team but he will not listen.* **Manager IT, firm 7**

		did not address sufficiently changes to project staff.	
2	Influence of vendor of cross functional team	Where cross-functional project teams were established (firms 1 – 6), individuals from the vendor worked alongside these teams, providing an opportunity to integrate their external knowledge with that of staff in the organization	*...So we spent late hours in the office along with the implementation partner, IT Manager and project champion to solve the problems....We were learning together over time to tackle mistakes...* **Executive (finance), firm 1.** *The implementation partner team was basically situated here [at the firm's premises] for six months..* **Chief Information Officer, Firm 2.** *During project planning along with our implementation partner we looked at the availability and requirements for resources like people, finance, time, and infrastructure and planned accordingly. … our implementation partner told us some common problems based on their experiences…* **Head of IT, firm 3**
3	Influence of cross functional team on internal communication	Formation of a cross-functional project team can be an important driver of internal communication.	*We created a full time working team… One person was volunteered from each department for the ERP team so they could represent their department…* **Chairman, firm 3.**
4	Influence of vendor on training of project team and users	Firms 1-6 used the vendor as a source of training, demonstrating that this is an important source of external knowledge and that training sessions are an effective organizational process for transferring that external knowledge into the firm	*Training on the overall concept of ERP was given by the vendor to all ERP team members and users. Later on, after few weeks customised training was given…* **Head of IT, firm 3.** *The implementation team came from Bombay to implement here. They were here for several months. They trained the core team members and me. I can remember, we all got different training depending on how we are going to get involved with ERP...our*

			knowledge and basically what we will do on the system... **IT Manager, firm 4.**
5	Influence of organizational absorptive capacity on organizational capability development	In firms 1 – 5, which exhibited both management prior knowledge and the development of organizational knowledge processes, implementation of ERP ran to planned time, budget and benefit expectations, suggesting that the firm had developed a capability to implement ERP. In firms 6 – 9, limited prior knowledge and poorly developed organizational knowledge processes, witnessed failed implementations, suggesting lack of capability development.	*Inventory costs have been significantly reduced after implementing ERP and labour costs have been reduced as the production of seats that was completed in two shifts can now be completed in one shift only. Definitely seating production cycles have been reduced and production capacity has been increased.* **ERP Manager, firm 1.** *In my view it has not been success. The company has not got any benefits …. How can we get benefits when it is not implemented completely?* **IT Manager, firm 7.** *ERP started in 2001 but was discarded in 2002. After spending almost one year, it was a total failure…* **Head of IT, firm 8.** *...it is certainly a success. It is giving us the desired benefits that were thought like smoother flow of information across all functions and locations within the company… …two main things have delayed our project. First I can say we had numerous difficulties in integrating the localised software with an international version…and secondly, there was no consistency in our team.* **General Manager (finance), firm 6.**
6	Influence of organizational capability development on management individual knowledge	Two of the firms (firm 1 and firm 8) had previous failed attempts at ERP implementation – and both believed that management had gained knowledge from these previous implementations.	*Due to unsuccessful customisation, our earlier ERP system never went live successfully. But this taught us* [the management] *lessons and those involved with implementation process. For example, it was realized that good vendor and is*

			a must for ERP project to be a success. **ERP Manager, firm 1**
			We have learnt from the previous implementation that customisation by the vendor can be very expensive ….vendors also do not have enough idea about the business processes as compared to staff in the firm. **Head of IT, firm 8.**
7	Influence of organizational capability development on organizational knowledge processes	Given the main tenet of our work that knowledge requires a knower, we believe that the main effect of feedback will operate through the increased knowledge of individuals within the firm, who in turn can implement effective organizational knowledge processes.	N/a