# Individuals' Absorptive Capacity in Enterprise System Assimilation

Pouria Khosravi
*Universiti Teknologi Malaysia*, kpouria2@live.utm.my

Azadeh Rezvani
*Universiti Teknologi Malaysia*, razadeh2@live.utm.my

Mohammad Nazir Ahmad
*Universiti Teknologi Malaysia*, mnazir@utm.my

# Individuals' Absorptive Capacity in Enterprise System Assimilation

Pouria Khosravi
Azadeh Rezvani
Faculty of Computer Science & Information Systems
Universiti Teknologi Malaysia
Email: kpouria2@ live.utm.my
Email: razadeh2@ live.utm.my

Maduka Subasinghage
Queensland University of Technology
Email: maduka.subasinghage@qut.edu.au

Melville Perera
University of Colombo
Email: jayanthamelvillep@yahoo.com

## Abstract

*The capability of an individual to absorb knowledge about enterprise resource planning (ERP) is a critical element in the development of an organisation's absorptive capacity (ACAP) during assimilation phase of ERP. Prior research have tended to overlook the roles that individuals play in identify external and internal knowledge, assimilate and exploit ERP knowledge. By defining ACAP at the individual level, we seek to enrich our understanding of how individual learn ERP knowledge and how such efforts facilitate the ERP assimilation within organisations. We develop a theoretical model to investigate the assimilation of enterprise systems in the post-implementation stage. Specifically, this model explains how communication climate and top management participation moderates the impact of Individuals' ACAP on the assimilation of ERP systems.*

## Keywords

ERP assimilation, individual absorptive capacity, top management participation, communication climate

## INTRODUCTION

Enterprise systems have become the most significant information technology used by most of the large and medium size organisations worldwide with the promise of greatly improving operational efficiency and enhancing organisational performance. However, many ERP projects have failed due to the complexity of ERP systems and this has led to financial difficulties for organisations (Xue et al. 2005). Since the outcome of an ERP project is highly dynamic, early success could become a later failure and an early failure could turn into a later success (Larsen and Myers 1999). Successful ERP implementation does not automatically lead to continued use of the system by the organisation, because the potential business value of ERP applications cannot be fully realized until they are extensively assimilated in an organisation (Liang et al. 2007) and success cannot be claimed until ERP assimilation is ultimately achieved by the organisation (Purvis et al. 2001). While there is a rich body of literature on ERP adoption, the implementation process and the critical success factors related to ERP projects (e.g., Nah et al. 2003; Lim et al. 2005), recently IS researchers have begun to address the assimilation phase of ERP (e.g., Liang et al. 2007; Liu et al. 2011; Saraf et al. 2012).

ERP assimilation occurs at multiple levels, specifically at organisation and individual levels simultaneously. At the organisation level, assimilation is indicated by the extent of ERP coverage of business processes and degree of ERP usage for decision making (Liang et al. 2007). At the individual level, assimilation is indicated by the degree of understanding of ERP systems and the ability to use the ERP for non-routine tasks (Liu et al. 2011). Therefore, individual level assimilation directly impacts the organisational level assimilation. In spite of the recent study in the assimilation stage, there is still a considerable dearth in research in this field (Yu 2005; Botta-Genoulaz 2005).

Prior studies express the significant role of firms' learning capabilities in the IT assimilation phase (Teo et al. 2003; Ravichandran 2005) and recently in ERP assimilation (Saraf et al. 2012). However, prior studies have

largely overlooked the role of individuals' learning capabilities in ERP assimilation, despite the important role played by individual users' ACAP in the knowledge transfer process (Park et al. 2007). Cohen and Levinthal (1990: 132) postulated that a firm's absorptive capacity "depends on the individuals who stand at the interface of either the firm and the external environment or at the interface between subunits within the firm". Individual users' absorptive capacity has been found to play a considerable role in knowledge transfer from ERP consultants to an organisation (Ko et al. 2005). The present study aims to further our understanding of the role of individuals' learning capabilities in the assimilation phase of an ERP. Therefore, the purpose of this study is twofold: 1. How do the learning capabilities of an individual ERP user affect ERP assimilation? 2. Is there any moderator affecting the influence of each dimension of an individual user's ACAP on ERP assimilation?

To capture the learning capabilities of individuals, and staying close to the original concept as defined by Cohen and Levinthal (1990) and the description of individual users' ACAP by Park et al. (2007), we describe an ERP user's ACAP as constituting four components: acquisition of knowledge from external sources, acquisition of knowledge from internal sources, assimilation, and exploitation of knowledge in the ERP system. In addition, we suggest that top management participation and communication climate moderate the relationship between these components and ERP assimilation. The first moderator, top management participation, refers to the behaviour and actions performed by top management to facilitate ERP assimilation (Liang et al. 2007). Prior studies claim that when top management encourages learning that is radical (Jansen et al. 2009; Berson et al. 2006) it reinforces existing practices and facilitates exploratory learning. The other moderator, communication climate, is the atmosphere within the organisation that defines accepted communication behaviour (Tu et al. 2006), which facilitates and improves individuals' ability to learn.

## THEORETICAL BACKGROUND AND RESEARCH MODEL

Figure 1 represented our research model. Each element of ACAP was assumed to affect the ERP assimilation positively. Additionally, top management participation and communication climate were assumed to moderate the relationships among each component of ACAP and the ERP assimilation.

### ERP Assimilation

The diffusion of innovation theory represents our primary approach to studying ERP assimilation. Bala and Venkatesh (2007) conceptualized four distinct stages of inter-organisational business process standards assimilation: awareness, adoption, limited deployment, and general deployment. Bajwa et al. (2008) presented an assimilation framework that highlights four states – limited, focused, lagging, and pervasive – based on the concepts of IT acquisition and utilization. In this study, we adopted the definition of assimilation by Purvis et al. (2001) as "the extent to which the use of technology diffuses across the organisational projects or work processes and becomes routinized in the activities of those projects and processes".

Post-implementation studies mostly focus on assimilation at the organisational level. For example, Armstrong and Sambamurthy (1999) examined the impacts of senior leadership, sophistication of IT infrastructure, and organisational size on IT assimilation. They found that CIOs' business and IT knowledge and the sophistication of IT infrastructure significantly impacted IT assimilation. Liang et al. (2007) considered the effect of external institutional pressures and the role of top management in ERP assimilation, and found that mimetic and coercive forces significantly influenced the ERP assimilation in organisations, but such influence was mediated by top management beliefs and participation. Wang (2008) found that in addition to institutional forces, external partners also had significant influence on the assimilation of ERP technology in the focal firm. Liu et al. (2011) proposed an individual-level ERP assimilation model that identifies factors like influence of direct supervisors, performance evaluation schemes, intrinsic motivation, and perceived usefulness influencing individual-level ERP assimilation. Saraf et al. (2012) examined the impacts of firm's ACAP on ERP assimilation and found that potential absorptive capacity and realized absorptive capacity had a positive direct impact on enterprise system assimilation.

What is absent in the assimilation literature, and ERP assimilation, is research at the individual level. Individual users play considerable roles in assimilation of technology in organisations. Individual users are accountable for any applying technology that becomes routinized. Unless the active user involvement and understanding of how the technology works beyond routine activities, the degree of assimilation of the technology in the individual is at the lowest level; therefore, technologies implemented and executed in business processes would be functional and apparent at best (Liu et al. 2011).
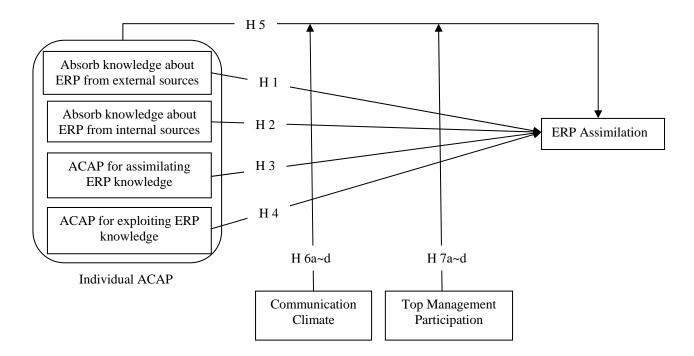
Figure 1. Individual ACAP and ERP assimilation

### Individuals' ERP Absorptive Capacity

Understanding an organisation's absorptive capacity offers extensive theoretical basis for understanding of its usage of IS (Boynton et al. 1994). Zahra and George (2002) suggested that absorptive capacity was an important factor for an organisation to implement a new IS successfully. Saraf et al. (2012) found that a firm's absorptive capabilities had a direct impact on ERP assimilation. Although the concept of absorptive capacity is well established in the organisational learning literature (Makri et al. 2010; Zahra and George 2002; Cohen and Levinthal 1990), IS literature (Armstrong and Sambamurthy 1999; Teo et al. 2003; Park et al. 2007) and specifically ERP assimilation (Saraf et al. 2012), this body of research has focused on the challenges an individual faces in assimilating ERP knowledge.

Cohen and Levinthal (1990) postulated that "the task of bringing in, processing and utilizing external knowledge in organisations falls to individuals". Following the original concept as defined by Cohen and Levinthal (1990), we define individual-level absorptive capacity as the level of effort that individuals undertake to identify external and internal knowledge, assimilate it and exploit knowledge to produce a dynamic organisational capability. Park et al. (2007) argued that individuals' absorptive capacities for comprehending, implementing and assimilating knowledge affect the performance of the ERP. Individual users' absorptive capacity plays an important function in the knowledge transfer development (Ko et al. 2005). They further claimed that official training and education was not sufficient to ensure that all the ERP users use the ERP system effectively.

The identification and acquisition of knowledge is generally agreed to be the first building block of absorptive capacity (Park et al. 2007; Lane et al. 2006; Zahra and George 2002). Identifying potentially useful knowledge is fundamentally a search process, requiring efforts from members of an organisation (Park et al. 2007). Individuals not only seek new knowledge externally, but do so in conjunction with internal efforts to create a viable knowledge base (Vasudeva and Anand 2011). This includes knowledge obtained from internal or external sources and pertaining to system-specific features (Saraf et al. 2012). Many individuals rely on internal sources of knowledge, that is, the transfer of knowledge within the organisation (Kogut and Zander 1992). To help encourage engagement with external sources, some organisations assign individuals to the role of gatekeeper to capture external knowledge (Allen and Cohen 1969). In the context of ERP, individuals could obtain novel knowledge concerning an ERP from external sources such as vendor-afforded training conferences (Ko et al. 2005), individual relations with consulting companies and vendor conferences' (Hirt and Swanson 2001). Individuals also absorb available internal knowledge such as help acquired from power users (Liu et al. 2011), idiosyncratic knowledge which could refer to those customizable business policies that are pertinent to

organisation-specific procedures (Saraf et al. 2012) and learning-by-doing when associated proficiency improved from prior knowledge is applied (Mustonen-Ollila and Lyytinen 2003).

Users' ACAP for understanding external and internal knowledge is one of the important components of absorptive capacity (Lane et al. 2006). In ERP settings, a user's ACAP for understanding knowledge is the user's acquired knowledge regarding ERP systems and ERP consulting firms (Park et al. 2007). All these examples assist in the achievement of ERP-related knowledge. Therefore, we expect:

H1: A higher level of users' absorptive external knowledge about ERP leads to a higher level of ERP assimilation in the post-implementation phase.

H2: A higher level of users' absorptive internal knowledge about ERP leads to a higher level of ERP assimilation in the post-implementation phase.

Despite the fact that acquired knowledge is valuable, it cannot be used while the beneficiaries do not assimilate it into their job setting (Zhao and Anand 2009). Study on information systems has also stressed the importance of the assimilation phase (Park et al. 2007; Fichman and Kemerer 1997). Fundamentally, any addition of new knowledge requires efforts to assimilate it with an organisation's existing expertise, skills and competencies. Accordingly, individual members of an organisation need to assimilate it and this process can be affected by how comfortable the user feels when executing the tasks using the technology (Park et al. 2007). Researchers have further claimed that effective assimilation of prior and newly acquired knowledge can lead to enhanced ERP performance through producing novel knowledge. The benefit of an ERP system will be confined to the automation of transactions if ERP users only understand the operational functions of the system rather than its embedded logic (Park et al. 2007).

These knowledge constructions fundamentally correspond to the unity among individuals in terms of their considerating of the ERP system (Baskerville et al. 2000), so individuals have a general comprehending of the extensive implications and objectives of the system. Thus, the assimilation capabilities play a significant role in ERP assimilation. Consequently, we expect:

H3: A higher level of users' absorptive capability for assimilating ERP knowledge leads to a higher level of ERP assimilation in the post-implementation phase.

Once ACAP has been assimilated with an organisation's internal knowledge, it is ready to be applied in the new processes or technologies (Zahra and George 2002). As Cohen and Levinthal (1990) argued, ACAP is not only the capability to understand and assimilate external knowledge, but the ability to exploit and commercialize it. To understand complicated technical problems some organisations dominated strong initiative but were not successful in translating such knowledge into innovation strategies (Zahra and George 2002). In the context of ERP, Saraf et al. (2012) defined organisations' ACAP for exploiting knowledge as an ability to exploit the benefits from ERP systems by facilitating greater usage. In this study, we use Park et al.'s (2007) definition of user capacity for exploiting knowledge, as the "user's ability to use and share ERP knowledge in specific tasks". In addition, the ability of users to implement knowledge can be augmented by dividing activities across teams, departments and the organisation (Kale and Singh 2007). The ability to share ERP knowledge with colleagues and other members of the organisation can augment the capacity for applying ERP knowledge. Therefore, we expect:

H4: A higher level of users' absorptive capability for utilizing ERP knowledge leads to a higher level of ERP assimilation in the post-implementation phase.

ERP users may also show high levels of endeavour on all dimensions of ACAP. We suggest that those individuals are able to benefit from the greatest synergies across the complete knowledge absorption process, and as such may have the best probability to facilitate ERP assimilation. Therefore, we expect:

H5: Combining absorptive knowledge, assimilation and utilization in individuals leads to a higher level of ERP assimilation in the post-implementation phase.

## Top Management Participation

The utilization of external knowledge requires someone who is passionate about the technology, can guide it through internal decision procedures, and take risks to ensure the potential of external knowledge is realized (Howell and Higgins 1990; Markham 1998). Research has found that when top management encourages learning that is radical (Jansen et al. 2009; Berson et al. 2006), this reinforces existing practices and facilitates exploratory learning. Moreover, top management participation has been found to significantly affect IT project performance by importing external knowledge and integrating internal knowledge (Ray et al. 2005) and plays a vital role in the utilization of external knowledge in the ERP assimilation phase (Liang et al. 2007). Although

knowledge may be assimilated by the individuals and the organisation, it still needs top management to advocate its application in innovative processes, to push it through internal assessments, and to overcome resistance (Andersson and Bateman 2000). By undertaking such efforts, individuals can build momentum behind the idea, enabling the concept of knowledge transfer through different stages to finally obtain the status of a novel idea. Top management participation refers to the behaviour and actions performed to facilitate ERP assimilation (Liang et al. 2007). Therefore, we expect:

H6: Top management participation positively moderates the relationship between: a) users' absorptive external knowledge about ERP; b) users' absorptive internal knowledge about ERP; c) absorptive capability for utilizing ERP knowledge; and d) the combination of absorptive knowledge, assimilation and utilization in individuals and ERP assimilation in the post-implementation phase.

### Communications Climate

The communication climate is the atmosphere within the organisation that defines accepted communication behaviour, which may facilitate or hinder the communication processes (Tu et al. 2006; Brown 1997). A growing body of literature has stressed that an open, supportive climate can significantly improve individuals' ability to learn, which leads to successful implementation of novel ideas. Nevis et al. (1995) posited that open climate is one of the 10 factors facilitating organisational learning. Therefore, a good communication climate may enhance the learning ability of ERP users. Thus, we expect:

H7: Communication climate positively moderates the relationship between: a) users' absorptive external knowledge about ERP; b) users' absorptive internal knowledge about ERP; c) absorptive capability for utilizing ERP knowledge; and d) the combination of absorptive knowledge, assimilation and utilization in individuals and ERP assimilation in the post-implementation phase.

## CURRENT RESEARCH DIRECTION

This research-in-progress will be carried out in a manufacturing organisation that adopted enterprise system packages. The sector is characterized by aggressive competition, leading to a high increase in the acquisition of IS. We will employ a quantitative method using a survey to collect data from the samples. The partial least square analytic approach will be used to test the proposed hypothesized relationships and identify the direct and indirect effects between the constructs of the suggested model.

## ANTICIPATED RESEARCH CONTRIBUTION

This study offers different contributions to research on absorptive capacity and IT innovation. First, as a novel contribution, exploring the ways in which individuals absorb external knowledge about an ERP system, we help ground the concept of ACAP in a set of activities related to individuals' efforts to acquire knowledge from external sources, acquire knowledge from internal sources, and assimilate and utilize ERP knowledge. In doing so, we attempt to fill a critical gap in our understanding of a central concept in ERP assimilation and organisational learning. Second, the study makes it easier to identify managerial practices by exploring the concept of individual ACAP to facilitate and motivate individuals to obtain new knowledge about ERP. Third, such logic is supported by the emerging IT governance knowledge approach (Tu et al. 2006; Lee et al. 2009). Fourth, we investigate to what extent top management participation and communication climate moderate the effect of ACAP on ERP assimilation. This recommends the significance of support and training through this phase and calls for managers to construct a good communication climate and ensure the capacity to improve and assimilate external knowledge.

## CONCLUSION

Regardless of the fact that a large amount of prior literature worked out in great details on organisations' ACAP, we believe that it is time for extensive research on individuals' ACAP. As a moderate attempt in the direction of this end we present an understanding of how the acquisition of knowledge from external sources, the acquisition of knowledge from internal sources, and exploitation of knowledge in an ERP system at the individual level affect ERP assimilation. This study is one of the few that attempts to investigate individuals' ACAP and integrate it with ERP assimilation. Further, we suggest that top management participation and communication climate moderate the relationship between individuals' ACAP and ERP assimilation.

## REFERENCES

Andersson, L. M. and Bateman, T. S. 2000. "Individual environmental initiative: Championing natural environmental issues in us business organizations." *Academy of Management Journal* (43:4),August,pp 548-570.

Armstrong, C. and Sambamurthy, V. 1999. "Information technology assimilation in firms: the influence of senior leadership and IT infrastructures." *Information Systems Research* (10:4),December,pp 304-327.

Bajwa, D., Lewis, L., Pervan G, Lai, V., Munkvold, and Schwabe, G. 2008. "Factors in the global assimilation of collaborative information technologies: an exploratory investigation in five regions." *Journal of Management Information Systems* (25:1),pp 131-165.

Bala, H. and Venkatesh, V. 2007. "Assimilation of interorganizational business process standards." *Information Systems Research* (18:3),September,pp 340-362.

Baskerville, R., Pawlowski, S., and McLean, E. 2000. "Enterprise resource planning and organizational knowledge: patterns of convergence and divergence." *In: Proceedings of the International Conference on Information Systems,* Ang, S., Krcmar, H.C., Orlikowski, W.J. & Weill, DeGross, J.I. (eds), pp. 396-406. The Association for Information Systems, Brisbane, Australia.

Berson, Y., Nemanich, L., Waldman, D., Galvin, B., and Keller, R. 2006. "Leadership and organizational learning: A multiple levels perspective." *Leadership Quarterly* (17:6),December,pp 577-594.

Cohen, W. M. and Levinthal, A. D. 1990. "Absorptive Capacity: A New Perspective on Learning and Innovation." *Administrative Science Quarterly* (35:1),March,pp 128-152.

Fichman, R. G. and Kemerer, C. F. 1997. "The assimilation of software process innovations: an organizational learning perspective." *Management Science* (43:1),October,pp 1345-1363.

Hirt, S. G. and Swanson, B. E. 2001. "Emergent maintenance of ERP: new roles and relationships." *Journal of Software Maintenance: Research and Practice* (13:6),November-December,pp 373-387.

Howell, J. and Shea, C. M. 2001. "Individual differences, environmental scanning, innovation framing, and champion behavior: Key predictors of project performance." *Journal of Product Innovation Management* (18:1),January,pp 15-27.

Jansen, J. J. P., Vera, D., and Crossan, M. 2009. "Strategic leadership for exploration and exploitation: The moderating role of environmental dynamism." *Leadership Quarterly* (20:1),February,pp 5-18.

Kale, P. and Singh, H. 2007. "Building firm capabilities through learning: The role of the alliance learning process in alliance capability and firm-level alliance success." *Strategic Management Journal* (28:10),October,pp 981-1000.

Ko, D., Kirsch, L., and King, W. 2005. "Antecedents of knowledge transfer from consultants to clients in enterprise system implementations." *MIS Quarterly* (29:1),March,pp 59-85.

Kogut, B. and Zander, U. 1992. "Knowledge of the firm, combinative capabilities, and the replication of technology." *Organization Science* (3:3),August,pp 383-397.

Lane, P. J., Koka, B. R., and Pathak, S. 2006. "The reification of absorptive capacity: A critical review and rejuvenation of the construct." *Academy of Management Review* (31:4),October,pp 833-863.

Larsen, M. A. and Myers, M. D. 1999. "When Success Turns into Failure: A Package-Driven Business Process Re-engineering Project in the Financial Services Industry." *Journal of Strategic Information Systems* (8:4),December,pp 395-417.

Liang, H., Saraf, H., Hu, Q., and Xue, Y. 2007. "Assimilation of enterprise systems: the effect of institutional pressures and the mediating role of top management." *MIS Quarterly* (31:1),March,pp 1-29.

Liu, L., Feng, Y., Hu, Q., and Huang, X. 2011. "From transactional user to VIP: how organizational and cognitive factors affect ERP assimilation at individual level." *European Journal of Information Systems* (20:1),January,pp 186-200.

Makri, M., Hitt, M. A., and Lane, P. J. 2010. "Complementary technologies, knowledge relatedness and invention outcomes in high technology mergers and acquisition." *Strategic Management Journal* (31:6),June,pp 602-628.

Markham, S. K. 1998. "A longitudinal examination of how champions influence others to support their projects." *Journal of Product Innovation Management* (15:6),November,pp 490-504.

Mustonen-Ollila, E. and Lyytinen, K. 2003. "Why organizations adopt information system process innovations: a longitudinal study using diffusion of innovation theory." *Information Systems Journal* (13:3),July pp 275-297.

Nah, F. F. H., Zuckweiler, K. M., and Lau, J. L. 2003. "ERP implementation: chief information officers' perceptions of critical success factors." *International Journal of Human-Computer Interaction* (16:1),pp 5-22.

Nevis, E., DiBella, A., and Gould, J. 1995. "Understanding organizations as learning systems." *Sloan Management Review* (36:2),January,pp 73-85.

Park, J. H., Suh, H. J., and Yang, H. D. 2007. "Perceived absorptive capacity of individual users in performance of enterprise resource planning (ERP) usage: the case for Korean firms." *Information & Management* (44:3),April,pp 300-312.

Purvis, R., Sambamurthy, V., and Zmud, R. 2001. "The assimilation of knowledge platforms in organizations: an empirical investigation." *Organization Science* (12:2),March/April,pp 117-135.

Ravichandran, T. 2005. "Organizational Assimilation of Complex Technologies: An Empirical Study of Component Based Software Development." *IEEE Transactions on Engineering Management* (52:2),May,pp 249-268.

Ray, G., Muhanna, A., and Barney, J. B. 2005. "Information Technology and the Performance of the Customer Service Process: A Resource-Based Analysis." MIS Quarterly (29:4),December,pp 625-652.

Saraf, N., Liang, H., Xue, Y., and Hu, Q. 2012. "How does organisational absorptive capacity matter in the assimilation of enterprise information systems?" *Information Systems Journal* (Early View Online Version of Record published before inclusion in an issue).

Teo, H. H., Wei, K. K., and Benbasat, I. 2003. "Predicting Intention to Adopt Interorganizational Linkages: An Institutional Perspective." MIS Quarterly (27:1),March,pp 19-49.

Tu, Q., Vonderembse, M., Ragu-Nathan TS, and Sharkey, T. 2006. "Absorptive capacity: Enhancing the assimilation of time-based manufacturing practices." *Journal of Operations Management* (24:5),September,pp 692-710.

Vasudeva, G. and Anand, J. 2011. "Unpacking absorptive capacity: Astudy of knowledge utilization from alliance portfolios." *Academy of Management Journal* (54:3),June pp 611-623.

Wang, P. 2008. "Assimilating IT innovation: the longitudinal effects of institutionalization and resource dependence." *Proceedings of 29th International Conference on Information Systems,* 14-17 December, Association for Information Systems, Paris, France.

Xue, Y., Liang, H., Boulton, W. R., and Snyder. 2005. "ERP Implementation Failures in China: Case Studies with Implications for ERP Vendors." *International Journal of Production Economics* (97:3),September,pp 279-295.

Yu, C. S. 2005. "Causes influencing the effectiveness of the post-implementation ERP system." *Industrial Management & Data Systems* (105:1),pp 115-132.

Zahra, S. A. and George, G. 2002. "Absorptive capacity: A review, reconceptualization and extension." *Academy of Management Review* (27:2),April pp 185-203.

Zhao, J. Z. and Anand, J. 2009. "A multilevel perspective on knowledge transfer: Evidence from the Chinese automotive industry." *Strategic Management Journal* (30:9),September,pp 959-983.

## COPYRIGHT