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COMPREHENSIVE UNDERSTANDING THE INHIBITORS AND ENABLERS OF KNOWLEDGE TRANSFER IN ERP ASSIMILATIONS: A MULTI-CASE STUDY

Weiwei Wang

Harbin Institute of Technology, weiweiw3@gmail.com

Luning Liu

Harbin Institute of Technology, liuluning@hit.edu.cn

Yuqiang Feng

Harbin Institute of Technology, fengyq@hit.edu.cn

Zhen Shao

Harbin Institute of Technology, shaozhenlily@yahoo.com.cn

Luan Gao

Harbin Institute of Technology, Harbin, China, ppgl0205@gmail.com

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COMPREHENSIVE UNDERSTANDING THE INHIBITORS AND ENABLERS OF KNOWLEDGE TRANSFER IN ERP ASSIMILATIONS: A MULTI-CASE STUDY

Weiwei Wang, School of Management, Harbin Institute of Technology, Harbin, Heilongjiang, China, weiweiw3@gmail.com

Luning Liu, School of Management, Harbin Institute of Technology, Harbin, Heilongjiang, China, liuluning@hit.edu.cn

Yuqiang Feng, School of Management, Harbin Institute of Technology, Harbin, Heilongjiang, China, fengyq@hit.edu.cn

Zhen Shao, School of Management, Harbin Institute of Technology, Harbin, Heilongjiang, China, shaozhenlily@yahoo.com.cn

Luan Gao, School of Management, Harbin Institute of Technology, Harbin, Heilongjiang, China, ppgl0205@gmail.com

Abstract

In the enterprise resource planning (ERP) assimilation process, organizations are increasingly concerned about how to ensure employees to have sufficient ERP knowledge effectively. However, limited attention has been directed toward examining knowledge transfer in the assimilation stage systematically. In particular, a significant omission is to understand the key enablers and inhibitors of employees' learning intention who may receiver knowledge passively in the mandatory setting. We employed a multi-case study method in this exploratory research by interviewing 33 ERP users at all levels in nine big-size firms in China. Results of this analysis suggested that causal ambiguity in new systems, incumbent system habit, and technostress significantly undermined recipients' learning intentions. Meanwhile, perceived management support, relation embeddedness, and symbolic adoption were key determinants of increased their learning intentions. This study is arguably the first that attempts to look into passive knowledge transfer phenomenon in some depth, and extends prior researches in ERP lifecycle by shedding light on the joint influences of enablers and inhibitors in ERP assimilation context.

Keywords: Knowledge Transfer, Learning Intention, ERP Assimilation, Passive Role, Mandatory Context, Multi-Case Study.

1 INTRODUCTION

In order to adapt enterprise resource planning (ERP) systems for organizational needs, knowledge transfer among employees are relatively common phenomenon in organizations today (Sasidharan et al. 2012). Empirical studies suggest that transfer of knowledge is critical across the complete ERP lifecycle due to its complexity. (Robey et al. 2002; Ko et al. 2005; Santhanam et al. 2007; Sedera et al. 2010). In general, ERP lifecycle is conceived as a multistage process (Markus et al. 2000; Swanson et al. 2004; Shao et al. 2012). Whereas the comprehension, adoption, and implementation stages establish milestones of initial ERP success (Ko et al. 2005), the assimilation stage is particularly important for organizations to realize returns on IS investments (Liang et al. 2007; Liu et al. 2011). However, rich and extensive IS literature has explored knowledge transfer in the comprehension, adoption and implementation stages in ERP lifecycle. In contrast, researchers within the field have offered relatively little insight into assimilation stage (Sedera & Gable 2010; Ebrahimi 2012). Specially, among the existed literature in assimilation (e.g., Volkoff et al. 2004, Häkkinen et al. 2007, Wagner et al. 2007), it is absent an empirical research concerned with identifying and understanding the key enablers and inhibitors in the transfer of knowledge from senders to receivers (Alavi et al. 2001; Roberts et al. 2012).

In the assimilation stage, ERP systems diffuse across the organizational work processes and become routinized in the execution of those processes (Purvis et al. 2001; Liang et al. 2007; Seddon et al. 2010; Liu et al. 2011). Unless most employees have sufficient knowledge of how to use the technical system effectively, organizations are unlikely to gain the benefits from ERP systems (Liang et al. 2007; Seddon et al. 2010). Employees and the organization will face significant knowledge barriers and often take considerable time to make necessary adjustments (Sasidharan et al. 2012). Veiga et al. (2013) argued that employees may not be engaged in knowledge learning, and grasp surface knowledge to fulfill momentary information needs and daily tasks simply. Thus, in this study, our focus is no longer on the initial transfer process from sources to receivers. Instead, this paper addresses the theoretical gaps surrounding knowledge transfer in assimilation stage by answering the following research questions. *What are the joint influences of enablers and inhibitors on learning intention of knowledge receivers in the ERP assimilation context?*

Given the limited prior attention in literature and the absence of strong theory, we adopted an exploratory multi-case study approach. Argote et al. (2003) suggest that knowledge transfer studies could examine key enablers and inhibitors in the characteristics of the relationship between knowledge units (e.g., relation embeddedness among peers or perceived support from management), the characteristics of the knowledge transferred (e.g., habit in incumbent ERP system or causal ambiguity in new ERP system), and the characteristics of the knowledge units (e.g., negative characteristics such as technostress or positive characteristics such as symbolic adoption).

The rest of the paper is organized as follows. First, we discuss a brief review of the knowledge transfer literature related to ERP assimilation. This is followed by a description of our case organization and the multi-case study methodology. Then we present our interpretation of the main findings of the case study, along with the propositions related to the significant enablers and inhibitors from the case evidence. These discussions lead to the development of a process model of knowledge transfer in assimilation. We conclude with a discussion of theoretical and practical implications of the findings in the study. We believe this study thus provides a foundation for future knowledge management and ERP assimilation research as well as valuable guidance to organizations which seek to maximally internalize the knowledge from the ERP system.

2 THEORETICAL BACKGROUND

2.1 Distinguishing between knowledge transfer in assimilation and other stages

Knowledge transfer refers to the communication process in which a recipient learns and applies knowledge transmitted from a source, and manifests itself through changes in the knowledge or performance of the recipient (Argote et al. 2000; Darr et al. 2000; Ko et al. 2005). This absence of knowledge transfer research in the assimilation context forces us to go to the literature on other stages in ERP lifecycle for theoretical guidance. Among the numerous attempts to identify different taxonomies of ERP lifecycle (e.g. Markus et al. 2000; Swanson et al. 2004; Shao et al. 2012), perhaps the best known is Swanson's four stages definition: comprehension, adoption, implementation and assimilation. Numerous investigators have identified the antecedents of knowledge transfer in the first three stages, but there are relative dearth of previous empirical work on assimilation stage (Sedera & Gable 2010; Ebrahimi 2012). Although the extant approaches contribute to our understanding underlying knowledge transfer in the ERP context, there are two significant distinctions and corresponding important reasons why the previous work does not suitably account for knowledge transfer in the assimilation stage.

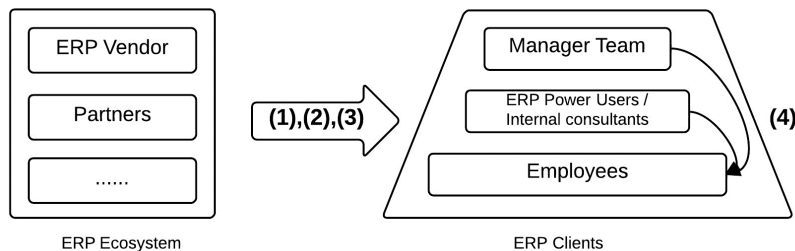


Figure 1. Knowledge Flow in the ERP Lifecycle
(1): comprehension; (2): adoption; (3): implementation; (4): assimilation.

First, the assimilation stage focuses on the transfer of knowledge at the intra-organizational level, although the first three stages are primarily concerned with external-internal knowledge flows at the inter-organizational level (as shown in Figure 1). Specifically, external parties possess the dominant role in the knowledge transfer dyad in the first three stages. In comprehension and adoption stage, ERP clients learn conceptual knowledge from ERP vendors or partners in order to make better decisions to devote resources in system implementation (Lapointe et al. 2007; Wang et al. 2009). Further, more details about the new systems are transferred when external consultants are invited to help in ERP implementation (Ko et al. 2005). In assimilation stage, as more knowledge about the customized system has been resided internally, external parties involve in knowledge transfer significantly less. Prior studies suggest that one employee may communicate with multiply knowledge resources within the organization, such as power users, internal ERP consultants, peers, and supervisors (Boudreau et al. 2005; Santhanam et al. 2007; Sasidharan et al. 2012). In addition, Van Wijk (2008) found that the antecedents of inter-organizational knowledge transfer inadequately explained in intra-firm context. Kane et al. (2005) also suggest that it is more efficient to transfer knowledge from units within the same organization compared with external sources.

Second, compared with the first three stages, the assimilation process is accompanied by increased stakeholders. Comprehension and adoption reflect high-level company executives' commitment to ERP adoption (Markus et al. 2000). Only few top management and IT specialists are involved in knowledge transfer activities. Implementation describes the process in which ERP is integrated as a normal part of the organizational work processes. Power users participate in knowledge transfer when taking over from the external implementation team. Assimilation refers to embedding ERP deeply and comprehensively in work processes (Liang et al. 2007). Stakeholders at all levels of an organization are involved in knowledge transfer activities, which might be more complicated than the first three stages. Knowledge transfer activities consist of extensive interactions and exchange of information

among employees as they learn to modify and adapt the system to the needs of their organizational tasks (Gallivan et al. 2005; Ke et al. 2012; Sasidharan et al. 2012). It may meet resistance in the innovative infusion process (Kim et al. 2009). For example, employees might rarely use the system to its fullest potential, thus preventing organizations from realizing the promised benefits (Li et al. 2013).

Therefore, this prior work suffers from these limitations in its suitability to offer comprehensive insight into what drives knowledge transfer in assimilation. Furthermore, most intra-organizational knowledge transfer researches have been done in non-IS contexts which are quite different from that being studied here (Ko et al. 2005). Given the lack of strong prior theories, it is fully expected that our understanding would evolve based on empirical findings.

2.2 Significance of the transfer of knowledge to a passive recipient in a mandatory context

ERP assimilation itself is a disruption in an equilibrium between motivating forces and knowledge receivers' resistance (Seddon et al. 2010). However, previous research has primarily assumed the rather proactive role of knowledge recipients while largely ignoring the importance of having knowledge recipients passively learn and adapt the ERP system. Notable IS scholars have called for infusing negative characteristics (for instance, in term of resistance or inertial) of a mandatory context into the studies (Boudreau & Robey 2005; Kim & Kankanhalli 2009; Klaus et al. 2010; Seddon et al. 2010; Ke et al. 2012; Veiga et al. 2013). ERP system is primarily designed for organizational usage. In contrast to software that users can tailor to fit individual needs, ERP packages are notoriously inflexible (Boudreau & Robey 2005). It is mandatory for individuals in the organization to learn specific ERP system application to finish assigned work when intended as well as unintended (Jasperson et al. 2005; Sun 2012). In other words, the employee's attitude and mental acceptance have no bearing on his or her choice of using the new ERP system (Wang et al. 2006).

Guided by this understanding, we aimed to identify key enablers that might contribute to motivate knowledge receivers as well as inhibitors that might potentially undermine knowledge transfer. Our effort to identify potentially relevant change forces and sources of restriction was guided by earlier framework that provided a useful starting point for explore knowledge transfer outcomes in the ERP context. Salient among this work is Argote et al.'s (2003) integrated framework, which provide directions for future research in identifying relationships between each categories of the properties of knowledge management context (properties of knowledge units, properties of the relationships between knowledge units, and properties of knowledge transferred) to that of the knowledge management outcomes (knowledge creation, retention, and transfer). We therefore draw upon this work as a basis for categorizing the enablers and inhibitors that we identify as potentially contributing to knowledge transfer in ERP assimilation. Similar to Sarker et al. (2012) and Hu et al. (2013), Argote et al.'s (2003) integrated framework may be considered as a theoretical anchor that guides the design of further case study protocol and as a starting point for exploration. Next section begins with an outline of case study research method, and is followed by the procedures used for data collection, data analysis and quality control.

3 CASE STUDY METHOD

Since there is little literature on knowledge transfer in ERP assimilation, we adopted case study methodology to conduct our research. Case study approach is considered as appropriate method for researching contemporary questions in natural settings where little or no previous research has been done (Dubé et al. 2003), and is appropriate to answer how and why questions about a phenomenon over which the researchers have little or no control in its real life context (Yin 2003). The case study method is widely used in IS research (e.g., Liu et al. 2011, Xiao et al. 2012, Sarker et al. 2012). Our research objective is how enablers and inhibitors jointly influence members' knowledge acquisition behaviors in ERP assimilation. Therefore, the case study method was adopted as the preferred strategy for this study.

We developed a case study protocol based on extensive literature on the theories related to ERP assimilation, organizational learning and knowledge management. The protocol outlined the scope and objectives of our research; semi-structured interview questions; characteristics of our target interviewees and firms. We followed the general guidelines for conducting positivist exploratory case studies, such as the philosophy of cross validation (Eisenhardt 1989; Yin 2003). Following the holistic multi-case design principle, we picked up a spectrum of members from target firms in various sizes and different industries. Interviewees vary in terms of organizational level, technology experience, work experience, voluntariness of use, education and many other characteristics (Jasperson et al. 2005). In the target firms, ERP systems also vary in terms of modules installed, number of users, industries and many other characteristics (Liu et al. 2011).

Firms	Location	ERP vendor	Type	Industry	Annual sales (million RMB)	Number of employees
A	Weihai	External contractors	Private	Shoes	1000	5000
B	Weihai	Oracle	State-own	Tyre	14000	9900
C	Weihai	Developed in house	Joint venture	Glass	1400	1800
D	Weihai	Developed in house	Joint venture	Carpet	1000	2000
E	Weihai	SAP	Oversea Investment	Electronics	800	6000
F	Zhengzhou	Oracle	Joint venture	Medicine	50	1000
G	Zhengzhou	UFIDA	Joint venture	Building	1800	1200
H	Zhengzhou	SAP	Publicly traded	Automotive	15000	20000
I	Zhengzhou	SAP	Private	Food	2000	20000

Table 1. Profiles of the Case Firms

Firm	Number of interviewees	Job title
A	2	IT Manager, Sales Manager
B	4	CFO, IT Manager(2), IT Internal Consultant
C	4	CFO, IT Manager, IT Internal Consultant, Supply Chain Manager
D	4	IT Manager, Financial Manager, Sales Manager, a User from Sales Department
E	3	CEO, Vice General Manager, Production Manager
F	3	IT Manager, Financial Manager, a User from Financial Department
G	4	IT Manager, Financial Manager, IT Internal Consultant, a User from Operational Department
H	5	IT Internal Consultants(2), IT Manager(2), a User from Financial Department
I	4	CIO, IT Manager, Financial Manager, IT Internal Consultant

Table 2. Profiles of the Informants

Based on the formulated criteria, a list of candidate firms was created through the researchers' knowledge about firms and industries. Past literature suggest that ERP adoption period can last as long as 6 months or longer after implementation (Seddon et al. 2010; Veiga et al. 2013). Thus, we specified that the focal firms which have at least 1 years of ERP experience. In the end, we selected nine large-scale firms with various ERP experience from our list of candidate companies. Give the confidentiality consideration, case companies are referred to as A ~ I in our study. Interviews were conducted at A ~ E in coastal areas of China in Dec 2010, at F ~ I in central China in July 2012. We asked the top executives in the focal firms to select interviewees at different organizational levels with diverse experience and background in both functional and MIS departments. Both table 1 and table 2 show the detailed profiles of all interviewees and the focal firms.

At each target firm, our research team spent one day average on conducting the interviews. Interviews lasted for an average of 30 minutes. With the permission of the interviewees, all interviews were digitally recorded and later transcribed into text by professional transcription service. In addition to

the interviews, team members also took field notes during the interviews, and collected presentations and documents about how their ERP system is actually used and firm background information.

4 RESEARCH FINDINGS

Topics of the interviews involved a broad range of issues related to knowledge management and organizational learning which resulted in a rich set of data and schemes. An analysis of the interview transcripts showed that there were a number of factors that may drive or constrain employees in the knowledge transfer process. Given our interest in offering generalizable findings, the following key enabling and inhibiting factors stand out among the many suggested in the transcripts: three enablers (relation embeddedness, perceived management support, and symbolic adoption), and three inhibitors (technostress, habit in incumbent system, and causal ambiguity in new system).

Table 3 shows the top six factors identified by multiple informants at different positions in some depth in different companies. Based on Argote et al.'s (2003) integrated framework, we submit that these enabling and inhibiting factors can be further grouped into three categories of the properties of knowledge management context related to the knowledge transfer outcomes. In the following sections, to present the rich case evidences effectively and focus on the significant cross-case patterns, we chose an approach that organizes within-case evidences under cross-case issues (Yin 2003). We provide a detailed account of these enablers and inhibitors with some of the interview quotes to substantiate our propositions.

Properties of Knowledge Management Context		Company								
		A	B	C	D	E	F	G	H	I
Units	Technostress (-)	√	√		√			√		
	Symbolic Adoption (+)					√		√	√	√
Relationship between Units	Relation Embeddedness among Peers (+)			√			√	√	√	√
	Perceived Support from Management (+)		√	√	√				√	
Knowledge	Habit in Incumbent System (-)		√				√			√
	Causal Ambiguity in New System (-)			√		√				√

Table 3. *Enablers and Inhibitors for Knowledge Transfer in ERP Assimilation*
 (+): the presence of this factor was found to positively contribute to learning intention;
 (-): the presence of this factor was found to negatively contribute to learning intention.

4.1 Inhibitors

4.1.1 Causal Ambiguity in New System

Causal ambiguity is defined as the degree of irreducible uncertainty about the functioning (Szulanski 1996; Szulanski et al. 2004). In the ERP context, the existence of causal ambiguity might cause the ERP knowledge imperfectly understood in the new context. It might be manifested by a gap between explicit knowledge as represented in formal training and software manuals and actual routine work practices as performed by the organization's members. Senior IT professional of firm I stated:

“During the first six months (in the implementation stage), we parameterized and tested ERP packages in a simulation environment with the help of the external consultants. They are professional in food industry. Therefore, we could get quick response from them. However, after system go-live, it was a totally new circumstance. We found lots of new issues, such as periodical end closing in financial accounting module. Although we had simulated month-end and year-end closing in test environment many times, we still met a big problem in the first year-end closing.”

Although some IS literature suggest that causal ambiguity is not the major obstacle in the context of ERP implementation, high causal ambiguity was widely viewed by informants as increasing the likelihood that users either avoid learning the ERP system or engage in perfunctory learning over the assimilation stage of a system. In a longitudinal comparison between implementation and assimilation stage, the CIO of firm I stated,

“One important characteristic of the knowledge is fragmented acquired in the standard training (during implementation stage). Most employees just had a conceptual understanding of the system components. After the external consultants left the project, it was a painful journey for our users to order the scattered experience in series, and rebuild the knowledge map. They needed more practice to get deeper understanding of the business rules incorporated into the system. Normally it will take a few months to link the knowledge together.”

The importance of causal ambiguity was underscored by informant observations that irreducible uncertainty causes barriers to apply collective knowledge in the new context. If anybody could not understand business rules in the ERP information chain, causal ambiguity will increase misunderstanding in other parts of the organization, which is widely regarded as presenting excessive risk to ERP assimilation. Thus, we propose:

PI: Causal ambiguity in new system is negatively associated with learning intentions in the ERP assimilation process.

4.1.2 Incumbent System Habit

The past knowledge transfer literature center on the implications that prior ERP experience can have on successful knowledge transfer in the ERP context (Ko et al. 2005). However, some discussion during interview sessions suggest that deep understanding in incumbent system contributes to the formation of incumbent system habit. The habit might lead members to choose to retain their existing way of doing things when organizations decide to discontinue the use of incumbent ERP systems. Incumbent system habit refers to learning sequences of acts that have been developed in the past with respect to an incumbent system, and have become automatic responses to specific situations (Polites et al. 2012; Polites et al. 2013).

Our interviews provided relatively rich evidences that incumbent system habits may inhibit learning of new systems. Firm E is an electronic manufacturing firm belonging to a multinational company. Firm E built an ERP application a few years ago, which ran well for its own business. In 2009, firm E replaced the previous system with a new system in order to meet integration requirements from its parent company. Compared with the old one, the new system is notoriously inflexible. CEO of firm E stated, “Frankly speaking, the previous system is closer to original business process. The new system is more complex. It requires employees to spend much more time in understanding various aspects of new system.” When asked about changes and new requirements brought by ERP system, financial manager of firm I stated:

“I think the positive changes brought by ERP include two parts: firstly, new working styles, for example, how to use ERP to complete my task; secondly, new working role, for example, how to finish new cross-function task. As extant experience is insufficient to meet the new situation, I need to expand my knowledge scope to grasp cross-function business knowledge, such as the relation between financial accounting module and production planning module. It may take about six months to learn a new module.”

We also found that interventions to disrupt members’ habits can play a key role in the successful learning of new systems. After implementing the new ERP system, it needs organization members to accept and learn changes in accounting procedures. The CFO of Firm B stated:

“The current system is quite different from the previous one. For example, the embedded accounting process is more complex than the extant accounting process. But staffs in financial department have been doing so regularly in the past. It is a long journey to change their minds. Instead of mandatory

means, I prefer to inspire them to analysis by themselves, and find out the advantages and disadvantages. ”

Thus, we propose:

P2: Incumbent system habit is negatively associated with learning intentions in the ERP assimilation process.

4.1.3 Technostress

Technostress refers to the stress state when individuals lack capabilities or resources to cope with the demands of organizational IT usage (Ragu-Nathan et al. 2008; Tarafdar et al. 2010). The negative effect of technostress has been found in simple information and communication technology organizational usage (e.g., Tarafdar et al. 2010). To date, little has been researched about the continuous influence of technostress in complex system like ERP. Technostress increases adopters' anxiety and grows frustration, which in turn increases confusion and misunderstanding when acquiring knowledge (Grimley et al. 2008; Veiga et al. 2013). In particular, when employees are under pressure to complete tasks with time constraints, they may fall back on using systems that require less mental effort, or systems with which they are already very familiar (Polites & Karahanna 2013).

IT manager of firm A explained his perspective on the staffs' negative emotion in learning ERP, "Most of the staffs are willing to learn the new system, but some of them may have emotional resistance. Few people even refuse to join in the training." Our informants indicated that technostress has a significant impact on the inadequate response to ERP learning, especially for the members who need to handle repetitive tasks in ERP system. In the focal firms, organization members are sensitive to a changing work environment. From our field observations, we identify two manifestations of technostress restraining the intention to learn: increasing work overload and technical uncertainty. Firstly, the increasing work overload brought by ERP needs members work faster. For example, in focal firm B, the workload was much heavier for the new financial budget planner role after ERP implementation. IT manager of firm A explained:

"It was relatively flexible to process inventory outbound in the past. Now the stock in the new system is frozen till related sales orders would have been approved. It does not allow any delay of recording daily sales activities in the system. The side effect is pressure increasing, which causes some salespeople refuse to learn and use the new system."

Secondly, our study also unearths the negative effect of technical uncertainty on learning behavior. For example, managers need to change their cognitive schemas in new ERP environment which is less compatible with their prior knowledge. IT manager of Firm B elaborated:

"(Middle level) managers have formed their own management style and a special set of management processes. It will be very slow for them to accept the process in the new system..... Some managers chose to use the new system to retain their existing way of doing things or engage in perfunctory usage of new system."

Thus, we propose:

P3: Technostress is negatively associated with learning intentions in the ERP assimilation process.

4.2 Enablers

4.2.1 Perceived Management Support

Some discussion during interview sessions centered on the implications that perceived management support can give to ERP learning intention. Previous studies assert that management support have two dimensions: management beliefs and management participation (Jarvenpaa et al. 1991; Liang et al.

2007). Management beliefs refers to a subjective psychological state regarding the potential of ERP, while Management participation refers to the behaviors and actions performed to facilitate ERP assimilation (Liang et al. 2007). We found plenty of evidences in our interviews to present all two dimensions of the perceived management support.

Our case evidences confirmed that management beliefs could facilitate knowledge transfer process through emphasizing organizational benefits proffered in training programs. The CFO of firm C elaborated: "Sometimes top management will participate in ERP seminars and workshops. Management team's concern in ERP project will determine the extent to which the staffs could perceive the organizational vision of the new system." We also found management support could reduce members' uncertainty about constantly ERP learning. The IT manager in Firm B stated: "The largest resistance is from the lowest level in the organization. It is important to get support from corporate executives in ERP diffusion within the organization."

Furthermore, the direct impact of management participation on knowledge transfer is to help in knowledge flows pathway building within the organization. Our interviews revealed that the support from both top level management and middle level management have significant influence on the users' learning intention. For example, in our field observation, we identified top management support could help to build top-down knowledge transfer pathway. We also find direct managers are key nodes in communication channel. The Sales manager in Firm D elaborated:

"In upward flow, middle level managers collect response and information from operator uses, and then report subsequent ideas or suggestions about the new system to the upper level. In downward flow, managers implement the decisions from top management, and contribute to the diffusion of ERP technology within the organization."

Thus, we propose:

P4: Perceived management support is positively associated with learning intentions in the ERP assimilation process.

4.2.2 Relation Embeddedness

Relationship embeddedness reflects the ease of communication and intimacy of the relationship, and could be characterized as on-job or off-the-job connections between a person and other people in the working environment (Mitchell et al. 2001). Consistent with the finding in (Uzzi et al. 2003), the statement from an ERP user of firm F and other similar statements prove that private knowledge sharing is an important communication channel. An ERP user of firm F said, "only 25% (of my ERP knowledge) was gained from formal training, 75% from private knowledge sharing, such as from peers and mentors." On-job links connect a person to the social web, and enrich potential channels for private knowledge transmission. This was illustrated by a user of finance department of firm G, "IT colleagues and I sit close to each other, which is convenient to communicate. We have good personal relationship too. I feel comfortable to express my thoughts."

Our interviews also indicated the important role of off-the-job relationships that is manifested by informal social activities outside of the workplace. Off-the-job links support the social-emotional needs of organization members, which determine individuals' beliefs about the extent to which the organization is concerned with their well-being. A user of financial department of firm H stated:

"It is easy to master entry level of PP module (Product Planning) knowledge. But it is no easy to become an expert in PP area. It requires a deep understanding in the module, such as variant configuration. Frankly speaking, there are no enough official opportunities to interact with PP experts. I think informal communication occasions could increase the frequency of interaction."

Further the representative quotes cross validated the point. A Senior IT professional from firm H stated: "Normally we don't discuss issues after work. But it could help in creating an enjoyable learning environment through group activities after work, such as spring outs and knowledge sharing meeting." And an IT professional of firm I stated:

“Informal activities after work could make communications in the workplace smoothly, and subsequently make it easier to complete the work. For example, some colleagues from IT department have strong technical capabilities, but they are too introverted to express themselves. Informal activities make them more outgoing.”

Hence, our interviews provided relatively rich evidence that either on-job or off-the-job links in general are particularly important to the formation of members’ learning intention. Then we propose:

P5: Relation embeddedness is positively associated with learning intentions in the ERP assimilation process.

4.2.3 Symbolic Adoption

Symbolic adoption is defined as “the peak motivational state reflective of a user’s mental evaluation of the technology and its use as a worthwhile concept” (Karahanna et al. 2006). The extant literature suggest that symbolic adoption shortcoming is closely linked to a limitation of individual resources devotion to engage in system use (Karahanna & Agarwal 2006; Wang & Hsieh 2006). As mentioned before, the assimilation stage is a mandatory context in which members are forced to interact with the system even before they have mentally accepted the system. Although informants occasionally identified external motivations as contributions to learning intentions of the new system, further analysis indicated that the motivations were only considered relevant to the extent when the organization members mentally accepted the new system. For example, when a user views the ERP artifact as a good idea, he/she is more likely to invest time and effort to engage in system learning. Production Manager of firm E Stated:

“I knew SAP was a powerful system because I used it before. In the ERP seminars and workshops, some of my proposals were rejected by IT department. But according to my understanding and prior experience, I refused to abandon my opinion, and won sometimes.”

CIO of firm H shared the experience of his growth as an ERP expert, and cross validated the point:

“Before joining company H, I had experienced many IS implementation projects. My mentor in the first project impressed me most. China's aid is not only about giving a fish, but teaching to fish. Besides the ERP knowledge, he also showed me design subtleties of the systems. Under his influence, I organized all ERP project related documents in this folder.”

Furthermore, a good understanding of employees’ heightened enthusiasm of ERP learning is vital to gain the overall potential benefits that can be derived from the system. This situation is illustrated by the informants who suggested that their job specifications needed to use the ERP system beyond routine tasks, for example, discovering new features as substituting existed feature for conducting new business. Financial manager of firm I stated: “I learned to search SAP-related information by self-study, and listed transaction codes to learn.” IT professional of firm G corroborated: “I would like to use my personal time to obtain extra practice in the system in order to increase my knowledge of ERP system.” These evidences and discussions lead to our final proposition:

P6: Symbolic adoption is positively associated with learning intentions in the ERP assimilation process.

4.3 Theoretical model

From the case evidences, we conceptualized a theoretical model summarizing the relevant enablers and inhibitors in learning intentions in Figure 2. Although there are certainly other important factors involved in the knowledge transfer process especially in the different domain or context, the model highlights the most significant influential factors identified in the assimilation context. These factors and proposed relationships have not been adequately discussed in the extant literature, thus constitute our main contribution to the literature.

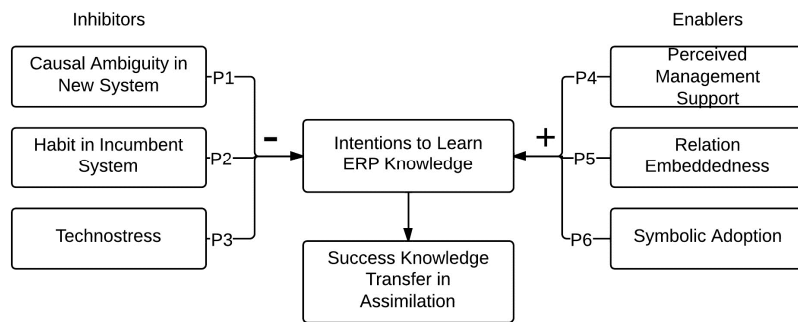


Figure 2. Research Model of Knowledge Transfer in ERP Assimilation

5 DISCUSSION AND IMPLICATION

This study addresses both the theoretical and empirical gaps in IS and knowledge transfer literature by systematically investigating intra-firm knowledge transfer in the ERP assimilation context. Because knowledge transfer research is concerned with identifying and understanding the enablers and inhibitors (Alavi & Leidner 2001; Roberts et al. 2012), our findings reveal important insights for understanding key enabling and inhibiting factors for knowledge transfer in ERP assimilation. A multi-case study was undertaken to develop a theoretical model and a set of related research proposals for offer comprehensive insight.

5.1 Theoretical implications

This study extends prior knowledge transfer theories and researches in ERP lifecycle by shedding light on the joint influences of enablers and inhibitors in ERP assimilation context. Several IS studies suggested the importance of negative characteristics in a mandatory IS context (Boudreau & Robey 2005; Kim & Kankanhalli 2009; Klaus & Blanton 2010; Seddon et al. 2010; Ke et al. 2012; Veiga et al. 2013). This study is arguably the first that attempts to look into passive learning phenomenon in some depth, offering a more penetrative understanding of knowledge transfer, especially in the mandatory setting of ERP assimilation context. We believe it is an important contribution since our literature review reveals the fact that past knowledge transfer researches are conducted with a commensurate focus on active organizational learning.

The results suggest that causal ambiguity in new system, incumbent system habit, and increasing technostress are the three most salient inhibitors impacting knowledge receiver's learning intentions. Firstly, despite all that causal ambiguity does not significantly impact on knowledge transfer in the implementation stage suggested by some literature (e.g., Ko et al. 2005; Xu et al. 2008), our case study found that greater causal ambiguity in new systems would reduce learning intentions. This result also confirms our point that previous knowledge transfer studies in adoption and implementation stage did not suitably account for the assimilation stage. Secondly, incumbent system habit was identified by interviewees as having a direct impact on learning intentions in new systems. Prior IS literature suggest that habit plays both positive and negative roles in IS use. For example, habit might facilitate the practice of routine system use, and prevent users from exploring unused system features (Polites & Karahanna 2013). Our study identifies the critical roles of incumbent system habit in learning new information systems when employees engage in ERP use above and beyond the minimal requirements that might provide organizational benefits such as increasing productivity. Thirdly, technostress was identified throughout the research as being among the most salient aspects of personality traits inhibiting ERP learning intentions. We extend the generalizability of adverse effects of technostress beyond past studies, which were conducted in simple IT usage contexts, such as end-user productivity and satisfaction (Ragu-Nathan et al. 2008; Tarafdar et al. 2010). Furthermore, this study also elaborated the influence of a number of enablers, including the level of perceived support from management team, the degree of relationship embeddedness, and the

depth of symbolic adoption. For example, the result implies that an organization member with high symbolic adoption is more likely to invest time and effort to engage in system learning. These results can be regarded as an important first step in theory development related to knowledge transfer in ERP assimilation.

5.2 Management implications

With respect to management implications, managers adopting costly ERP should realize that unlike the shortcoming of personal prior knowledge and the intricacies of an ERP system that are difficult to change, enablers and inhibitors are potentially more malleable. The mandatory ERP deployment may increase employees' technostress and inevitable frustrations, which would subsequently increase the adopters' confusion and misunderstanding. Moreover, since the organizational inflexible system may pose negative, longer-term consequences for employees, it may inadvertently make employees learn new knowledge as little as possible, and illy motivated to apply the knowledge in innovational ways.

This study also provides some guidance for IS managers who increasingly need to better understand how to facilitate knowledge transfer within organizational boundaries in post-implementation stage. First of all, when the organization members have mentally accepted the ERP system, they will actively devote their resources to engage in system learning and use. Second, the establishments of employee work network can be critical to facilitate the receivers' search for and utilization of knowledge within the firm; although knowledge transfer may not occur in informal group activities after work, individuals can dissipate stress and anxiety by the off-the-job communication channels. In addition, organizations need to acknowledge the importance of socio-emotional support from high level managers and direct managers, which would alter employee attitudes toward organizational benefit expectations for the new system.

5.3 Limitation and future research directions

Despite its theoretical and practical contributions, our study has limitations and also opens opportunities for future research. First, our study was conducted in a mandatory context, which may not generalize to voluntary settings (Klaus & Blanton 2010). We suggested future research on knowledge transfer considering the role of voluntary situations in the assimilation stage. Second, we examined the impact of a limited set of enablers and inhibitors on knowledge recipients. We encourage future research to validate the findings and develop more sophisticated theoretical models which can be empirically validated. Third, as the transfer process includes both knowledge transmission and knowledge reception, prior researches have suggested a broad range of factors that may influence the outcome of knowledge transfer efforts (Jane Zhao et al. 2009). Future research could consider the impact of other factors combinations on knowledge transmission process, for example, knowledge transfer portfolios.

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