

# UNDERSTANDING KNOWLEDGE TRANSFER IN ENTERPRISE SYSTEM ASSIMILATION: THE CRITICAL ROLE OF SOCIALIZATION TACTICS

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## Abstract

*It is critical to the success of enterprise systems (ES) assimilation that employees acquire sufficient knowledge and apply the knowledge effectively in routine system use. Drawing from knowledge management and socialization theories, we develop a theoretical model for better understanding how management could exercise socialization tactics to promote the transfer of knowledge, and thus improve the knowledge application outcomes in ES assimilation. We validate the model through survey data from employees in 14 companies which have implemented ES for more than one year in China. We find that socialization tactics strongly impact the properties of knowledge acquisition (depth, breadth, and linkage), which in turn influences knowledge application by users (habitual and extended use). Interesting, while the depth of knowledge impacts the breadth and linkage of knowledge, it does not have a significant direct impact on knowledge application. Theoretical and practical implications of these findings are discussed.*

*Keywords: Knowledge transfer, Knowledge application, Socialization tactics, Enterprise system assimilation.*

# 1 INTRODUCTION

With the promise of greatly improving organizational processes, enterprise systems (ES), e.g., enterprise resource planning (ERP) systems, have been embraced by many large and medium sized organizations around the world. However, ES underutilization is a common phenomenon and often attributed to failures in knowledge transfer and knowledge application in the post-implementation phase (Alavi et al. 2002), known as the assimilation phase. Empirical studies found that knowledge transfer is critical in overcoming knowledge barriers to assimilating ES in work processes (Santhanam et al. 2007; Sasidharan et al. 2012). Knowledge transfer in ES assimilation manifests itself through individual knowledge accumulation and skill enhancement (Liu et al. 2011). But merely transferring knowledge to ES users is not enough if the knowledge is to be effectively applied to solving problems with ES (Choi et al. 2010). After the initial knowledge acquisition, effective knowledge application may help organizations to understand the knowledge sufficiently, and translating it into sustained innovations (Alavi & Tiwana 2002).

Hence, it is of great academic interest and significance to investigate knowledge transfer and application behaviors of employees, who occupy a range of roles in various organizational units involved in system assimilation to leverage implemented system (Liu et al. 2011). Synthesizing the literature, we know a great deal about how knowledge transfer affects knowledge application in general (Choi et al. 2010), yet, we know very little about what influences knowledge transfer and how characteristics of transferred knowledge impact knowledge application. There is very little empirical research examining how different types of knowledge transferred contribute to different types of knowledge applications in the ES assimilation context.

Further, in an organizational setting, the role of socialization mechanisms in knowledge transfer is not well understood. For information systems with low complexity, individuals can acquire knowledge through their own learning and experiences (Sharma et al. 2007). In contrast, it is difficult to achieve success in ES assimilation without significant organizational intervention (Sharma & Yetton 2007). Jasperson et al. (2005) suggested that intervention mechanisms need to evolve when the understandings of ES applications evolve over time in the assimilation process. Slaughter et al. (2006) also suggested that effective intervention mechanisms in knowledge transfer are dependent, in part, on using a combination of portfolios rather than relying on a single mechanism.

Drawing on socialization theory, we examine how diverse socialization tactics influence knowledge transfer in ES assimilation. Socialization tactics has not been adequately investigated in theoretical or empirical studies in the extant IS literature, with the notable exception of Ke et al. (2012). In addition, prior research has primarily focused on investigating the effect of socialization tactics on employees' motivation to learn and use systems (Ke et al. 2012), while not addressing the effect of the various socialization tactics on the transfer of knowledge. This study addresses the theoretical gaps surrounding knowledge transfer and knowledge application in the ES assimilation phase by addressing the following research questions:

- What are the knowledge application behaviors in ES assimilation?
- What are the characteristics of knowledge transferred in ES assimilation?
- How do knowledge characteristics impact knowledge application?
- How do socialization tactics influence knowledge transfer?

## 2 THEORETICAL MODEL AND HYPOTHESES

### 2.1 Knowledge Application in ES Assimilation

ES assimilation is defined as the extent to which the use of ES diffuses 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). Assimilation can be decomposed into routinization and infusion stages in the overall innovation diffusion process (Kwon et al. 1987). Routinization refers to the process to use

ES as a normal part of work routine; Infusion refers to the process to embed ES deeply and comprehensively in the work processes (1994).

Knowledge application refers to “the phase in which existing knowledge is brought to bear on the problem at hand” (Alavi & Tiwana 2002, P1030). Knowledge application is an important aspect of knowledge management, because knowledge enhances organizational value when it is used to produce effective performance (Alavi et al. 2001; Alavi & Tiwana 2002; Choi et al. 2010). Attewell (1992) linked organizational learning and innovation diffusion, and suggested that firms will defer innovation diffusion until the knowledge can be used effectively. In the ES context, employees use the system to perform a task, accordingly, knowledge application reflects an individual’s response to assimilation process by utilizing the knowledge to support and improve work performance.

From the theoretical perspective on switching from habitual behavior to active thinking (Louis et al. 1991), we distinguish two key interrelated behaviors of knowledge application: habitual application, or applying ES knowledge automatically in response to routine tasks because of learning (Limayem et al. 2007; Polites et al. 2013), and extended application, or applying ES knowledge to support a more sophisticated set of work tasks (Saga & Zmud 1994; Hsieh et al. 2007). On one hand, habitual application of ES knowledge captures the idea behind routinization. Saga and Zmud (1994) suggested that routine and actual behavior mirror “unvarying procedures, habits or customs that are a regular part of daily life” (Saga & Zmud 1994, P75). In routinization process, ES is no longer perceived as new. ES knowledge starts to be institutionalized within an organization (Wang et al. 2009). Employees may develop a habit of selecting a particular set of ES features in a mentally efficient manner for supporting daily work (Polites & Karahanna 2013). In addition, Limayem et al. (2007) argued the difference between routine and habit, as “no matter how often she performs the routine, the employee is unlikely to turn it into a habit since its performance won’t satisfy her” (Limayem et al. 2007, P717). On the other hand, extended application is related to infusion. Beyond standard ways to support existing work tasks, extended application lets employees to utilize the full potential of the system for their work (Hsieh & Wang 2007).

The formation of habitual application is likely to influence employees to apply their knowledge in a more comprehensive and sophisticated manner. First, Charng et al. (1988, P306) expected that habit as repeated behavior in the past has a direct effect on behavior in the future. Limayem et al. (Limayem et al. 2007) found that habit formed in learning an ES positively affects continued use of the particular ES. Employees often take considerable time to make necessary adjustments while facing significant knowledge barriers in assimilation process (Sasidharan et al. 2012). However, habitual behavior without conscious control is both effortless and efficient (Limayem et al. 2007). Thus, it tends to be easy to apply knowledge to support activities after the application of knowledge becomes habitual in daily work.

Second, the scope of habitual application is usually limited in only one or a relatively small number of daily tasks (Polites & Karahanna 2013). Through the first-hand experience accumulated in automatic learning processes, employees have the potential to use the system in a more comprehensive manner. For example, employees might change technical components embedded in the commands and tools of ES packages to meet the expanded business requirement (Barki et al. 2007). Thus, we posit that:

*H1: Higher levels of habitual application of knowledge lead to higher levels of extended application of knowledge.*

## **2.2 Knowledge Transferred in ES assimilation**

Knowledge transfer refers to the relocating process of distributed knowledge within the organization (Alavi & Leidner 2001), in which employees learn and apply knowledge in a new context where the knowledge is needed (Ko et al. 2005).

It is important to understand knowledge taxonomies because theoretical understanding of knowledge transfer is influenced by the distinction among knowledge properties (Alavi & Leidner 2001). Perhaps the best known knowledge taxonomy was the distinction between explicit and tacit knowledge

(Polanyi 1967; Nonaka 1994). Explicit knowledge can be articulated. Tacit knowledge is difficult to articulate as it is rooted in personal action and experiences.

However, the distinction of knowledge types does not apply universally (Wang & Ramiller 2009). Ko et al. (2005) suggested that ES knowledge may be “explicit or tacit, or both” (Ko et al. 2005, P60). To be more relevant to ES assimilation, the dichotomous categorization has been expanded and refined into finer categories in IS research.

Within this stream of research, IS scholars define and measure a firm’s knowledge base in areas related to a focal innovation as a multidimensional conceptualization, specifically in terms of three components: knowledge depth (also called related knowledge), knowledge breadth (also called knowledge diversity in some studies), and knowledge linkages (also called learning-related scale) (Fichman et al. 1997; Fichman 2001; Carlo et al. 2012). Knowledge depth refers to the relative quality and level of possessed knowledge (Carlo et al. 2012); knowledge breadth refers to the range of possessed knowledge (Fichman 2001); knowledge linkages refers to “the breadth, reach, and intensity of channels through which knowledge can be externally identified and assimilated” (Carlo et al. 2012, P870).

Knowledge depth and knowledge breadth constitute inward-oriented elements of knowledge asset (Cohen et al. 1990; Carlo et al. 2012; Roberts et al. 2012). From an absorptive capacity perspective, high level of knowledge depth makes organizations easier to absorb new knowledge related to the innovation; similarly high level of knowledge breadth makes organizations more likely to appreciate the value of new innovation (Fichman 2001). In contrast, knowledge linkages as “knowing-who element” are outward-oriented elements interfacing the organizations and their environment (Carlo et al. 2012, P870). Organizations with high level of knowledge linkages have a greater opportunity to amortize learning costs, and thereby innovate more economically (Attewell 1992; Fichman 2001).

Other classifications have been introduced to explain knowledge in ES context, such as know-what, know-why, and know-how (Santhanam et al. 2007; Wang & Ramiller 2009). Garud (1997) suggested that it is important to anchor the understanding of knowledge distinction at some level of abstraction. From a depth and breadth perspective, know-why at one level of generality may represent know-how at a deeper level of specificity (Wang & Ramiller 2009). In addition, these concepts concern more about the internal knowledge asset and skill and less about the importance of the link with external resources as a cognitive structure for “who knows what and who knows who knows what” (Jarvenpaa et al. 2008, P260).

What has been lack in knowledge transfer literature in organizational settings is empirical research at the individual level, as the conception and measurement of knowledge depth / breadth / linkages are largely conducted at the organizational level in extant research. At the individual level in the context of ES, knowledge depth is viewed as the extent of abstract knowledge possessed by an individual in areas related to ES assimilation; knowledge breadth is viewed as the range of knowledge possessed by an individual with respect to ES assimilation; Knowledge linkages are viewed as knowing how/where to acquire additional information in areas related to the ES employed in the organization (Davis 2013).

This tri-dimensional view of knowledge renders a more holistic conceptualization and captures the richness of knowledge transferred with regard to individuals in the ES context. Among these three knowledge properties, knowledge depth may increase the level of knowledge breadth. This is because individuals with higher degree of knowledge depth can identify and assimilate new knowledge better (Cohen & Levinthal 1990). ES knowledge covers inter-individual components which serve cross functional tasks (Sharma & Yetton 2007). Knowledge at a deeper level increases the breadth by recontextualizing assimilated knowledge for its potential value (Carlo et al. 2012).

On the other hand, high level of knowledge depth may increase the possibility of new linkages among knowledge elements as well. Carlo et al. (2012) found that the units with higher level of knowledge depth sense more external knowledge. In turn, gaining more external knowledge within an area promotes knowledge understanding in more details. Thus, we propose that:

*H2a: Higher levels of knowledge depth lead to higher levels of knowledge breadth.*

*H2b: Higher levels of knowledge depth lead to higher levels of knowledge linkages.*

## 2.3 Knowledge Transfer and Knowledge Application

Knowledge application implies a priori knowledge transfer or sharing (Choi et al. 2010). On one side, knowledge transfer is a prerequisite for the formation of habit (Limayem et al. 2007). On the other side, literature also indicate that knowledge transfer in ES assimilation is key to effective ES usage and realize the full potential of the ES implemented (Seddon et al. 2010).

But mere knowledge transfer is not enough. Knowledge transfer does not necessarily lead to value creation unless the knowledge is applied in solving problems (Alavi & Leidner 2001; Alavi & Tiwana 2002; Choi et al. 2010). For example, Choi et al. (Choi et al. 2010) found that knowledge application mediates the influence of knowledge transfer on team performance. Despite the fact that scholars have noted and studied the important role of knowledge transfer in ES assimilation (Santhanam et al. 2007; Sasidharan et al. 2012), the studies we found have not established strong theoretical foundations for linking the knowledge transfer to knowledge application.

### 2.3.1 Knowledge Depth and Habitual Application

As an employee' knowledge depth increases, the employee gains better learning practice. This leads to higher levels of familiarity with the ES, resulting in performing knowledge application with little cognitive effort (Limayem et al. 2007). In addition, high level of knowledge depth will increase the understanding of the advanced ES features. This leads to higher level of satisfactory experience in repeatedly using the same knowledge again and again, yielding higher level of habitual knowledge application (Limayem et al. 2007). Thus, we posit that:

*H3a: Knowledge depth positively influences the level of habitual knowledge application.*

### 2.3.2 Knowledge Depth and Extended Application

Extended application dissolves a more comprehensive set of work tasks, and reveals the potential of the additional system features for existing tasks (Li et al. 2013). High levels of knowledge depth increase the likelihood of keeping employees in a state of change by trying new features in ES implemented for business processes. Prior literature presented evidence on the positive relationship between knowledge depth and innovation utilization (Dewar et al. 1986). When employees' knowledge depth increases, they can expand current knowledge into new areas for new purposes. Thus, we posit that:

*H3b: Knowledge depth positively influences the level of extended knowledge application.*

### 2.3.3 Knowledge Breadth and Habitual Application

As breadth of a knowledge base increases, employees have access to more diverse technology or business knowledge and their interactions (Roberts et al. 2012). The habitual behaviors correspond to replication effort aimed at developing a general habit of using applications or technology when faced with special work routine. Polites et al. (2013) suggested that employees' cognition within organizations is anchored and refined with respect to a large automatized task sequences. Higher levels of technology or business knowledge would increase "the prospect that incoming information will relate to what is already known" (Cohen & Levinthal 1990, P131). This leads to taking advantage of an ES' overall functionality, resulting in stronger habitual development than the individuals who use ES in more limited ways (Limayem et al. 2007). Thus, we posit that:

*H4a: Knowledge breadth positively influences the level of habitual knowledge application.*

### 2.3.4 Knowledge Breadth and Extended Application

Employees with high level of knowledge breadth will not confine their ES usage to specific situations only. Fichman et al. (1997) argued that high levels of knowledge breadth are more likely to initiate and sustain the assimilation of technologies. As knowledge breadth increases, new knowledge combinations lead to a larger numbers of novel knowledge associations and linkages (Cohen &

Levinthal 1990; Carlo et al. 2012), resulting in more comprehensive knowledge application. Thus, we posit that:

*H4b: Knowledge breadth positively influences the level of extended knowledge application.*

### 2.3.5 Knowledge Linkages and Extended Application

Damanpour (1991) argued that the scope and intensity of individuals' social linkages influence the success of external knowledge searches. Extended knowledge application requires constant knowledge searching. Searches and exploration allow individuals to identify new ways while their interpretations lead to assessment of their business value and integrate it into its knowledge structure (Cohen & Levinthal 1990; Carlo et al. 2012). Several studies also show that employees with more knowledge linkages are more likely to be engaged in innovation activities [59]. In addition, as knowledge linkages increases, higher levels of knowledge searching bring additional perspectives to evaluate garnered knowledge. This decreases uncertainty of the future value of extended knowledge application (Carlo et al. 2012). Thus, we posit that:

*H5: Knowledge linkages positively influence the level of extended application.*

## 2.4 Socialization Theory

To socialize newcomers is an ongoing process in which a newcomer "acquires the social knowledge and skills necessary to assume an organizational role" (Van Maanen et al. 1979, P211). One research stream in socialization theory emphasizes the tension between organizational enculturation and individual self-expression. Organizations can strategically invest in structured tactics to help newcomers' transition into their new roles (Cable et al. 2013). Another research stream focuses on the proactive role of newcomers in socializing themselves into their new environment (Kim et al. 2005). Rather than advising organizations to highlight and leverage newcomers' unique perspectives, proactivity research suggests that new employees can motivate themselves to seek information so that they can learn organizational norms and fit into the culture (Kim et al. 2005).

These two research streams correspond to the IS scholars' call for applying the learning perspective to understand post-adoption behavior in which the individual decision might be voluntary or mandatory (Jasperson et al. 2005). Mandatory decisions reflect the situations when the organization is induced to both adopt an ES and force employees to use the ES when intended as well as unintended (Jasperson et al. 2005). Typically, when employees are mandated to use ES, firms may encounter employee resistance or inertial in the ES assimilation process (Seddon et al. 2010). Hence, an investigation into organizational socialization strategies for ensuring individuals to learn to be part of an organization's pattern after adoption of an ES is of great interest and significance.

Among several socialization strategies, one of the best-developed theoretical models is Van Maanen et al.'s (1979) seminal framework of socialization tactics. Based on their framework, several studies investigated the impact of socialization tactics on individual adjustment within organizations [69]. The tactics have been factor-analyzed into three broader constructs: context-related tactics, content-related tactics, and social-related tactics (Jones 1986). Content-related tactics concern the extent to which organizations facilitate members to receive systematic, accurate, and consistent knowledge and information; Social-related tactics concern the extent to which organizations provide interactions with experienced organizational members during socialization; Context-related tactics concern the extent to which organizations help members to establish a shared set of norms and values through clearly defined socialization activities.

Furthermore, the three dimensions of tactics place on a single continuum ranging from the high level (or institutionalized tactics) to the low level on the other end (or individualized tactics) (Van Maanen & Schein 1979; Jones 1986). A high level of tactics reflects a more structured and formalized socialization process, and reduces the inherent uncertainty to ensure custodial role orientations (Van Maanen & Schein 1979). In ES innovation context, Fichman et al. (1997) argued that firms with centralization and formalization mechanisms should be better able to obtain consensus and assimilation of the innovations. In particular, tactics higher in content provide more specific

information about sequenced orientation activities and timed training; tactics higher in social provide more interactions to help newcomers to access structured forms of modeling and social support; tactics higher in context provide more common learning experiences and formal framework of organizational activities (Cable et al. 2013).

#### *2.4.1 Context-Related Tactics and Knowledge Breadth*

High level of context-related tactics signal that an organization's willingness to invest resources in individual adjustment to the new work environment (Van Maanen & Schein 1979; Jones 1986). We expect context-related tactics to positively influence the level of knowledge depth. Training program is one important manifestation of context-related tactics. When delivering ES training, prior research suggest that it needs to take into account the task interdependencies among users (Sharma & Yetton 2007). High level of context-related tactics teaches employees specific languages within the organization to enhance the understanding of background knowledge (Chao et al. 1994). Polites et al. (2013, P239) suggested that high level of "training-in-context" is critical in learning on collaborative task knowledge.

However, high levels of context-related tactics may cause mental prisons and lead to poor information search as well as selective perception of information and alternatives (Volberda et al. 2005). Alternatively, low levels of such activities may encourage employees to acquire knowledge "informally on a trial and error basis" and engage in innovatively learning behaviors (Van Maanen & Schein 1979). Thus, we do not expect high levels of context-related tactics to significantly influence exploration for deeper knowledge understanding or more knowledge linkages. Thus, we posit that:

*H6: Higher levels of context-related tactics increase the breadth of knowledge transferred.*

#### *2.4.2 Content-Related Tactics and Knowledge Depth*

High levels of content-related tactics usually permeate through the channels of sequential learning activities and the timing associated with completing each socialization step (Van Maanen & Schein 1979; Jones 1986). Such tactics facilitate employees to receive systematic, accurate, and consistent information, which subsequently reduces employees' uncertainty and helps employees establish personal control (Cable et al. 2001). Because such tactics entail a degree of creative license, it is expected that employees to be more inclined to develop a deeper understanding of the system (Barki et al. 2007).

In addition, the sequential learning activities provide employees an opportunity to make sense of their environment. Specifically, high level of content-related tactics helps employees address their need for relatedness in each stage, and decrease employees' sense that they are on their own in a "sink or swim" environment (Van Maanen & Schein 1979). Thus, employees should be more inclined to accept new knowledge which might be incompatible with existing knowledge schemas. Thus, we posit that:

*H7: Higher levels of content-related tactics increase the depth of knowledge transferred.*

#### *2.4.3 Social-Related Tactics, Knowledge Depth and Knowledge Linkages*

High levels of social-related tactics affect the establishment of interpersonal relationships (Van Maanen & Schein 1979). This leads to congruence of values, needs, and beliefs among employees within the firm (Volberda et al. 2005). Davis (2013) found that increasing volunteering of IT knowledge sharing will improve the technical innovation of the whole organization. Employees are likely to be encouraged to engage in the positive interaction will exchange more much-needed information, resulting in the combination of newly acquired and existing knowledge (Gupta et al. 2000).

In addition, high levels of social-related tactics provide users with opportunities to communicate with experienced colleagues (Van Maanen & Schein 1979). This directly increases the scope of knowledge linkages and the quality of knowledge transferred. Experienced ES users have intimate knowledge about the ES and its inner workings within an organization (Liu et al. 2011). Sasidharan et al. (2012) argue that in-degree-centrality of knowledge network is positively related to the perceived

information quality. Thus, we believe that interaction with experienced employees is an important channel to shape high-quality knowledge structure. Thus, we posit that:

*H8a: Higher levels of social-related tactics increase the depth of knowledge transferred.*

*H8b: Higher levels of social-related tactics increase the linkages of knowledge transferred.*

### 3 RESEARCH METHOD

#### 3.1 Data Collection

We collected the data using an individual level survey instrument to test the research model. The survey instrument was developed from existing validated measurements based on a comprehensive literature review. The data collection consisted of three steps. First, modifications were made to existing scales to make them more suitable for the research context. As the target organizations are located in China, the questionnaire was translated into Chinese and a panel of ES consultants examined the content validity of the items. Second, a pilot study was conducted to examine construct validity and reliability. Questionnaires in Chinese were first distributed to 40 employees in a manufacturing firm that have implemented an ERP system. Minor modifications were made based on the subjects' comments. Third, the revised version of the questionnaire was administered to 230 subjects in 14 firms we identified that have been using some types of ES for at least half year.

Eight of these firms are located in the largest cities in China, and the rest six firms in the Yangtze River Delta region in east China. It represents a wide range of geographical and cultural breadth. The survey was administered to employees who use ES in their daily work. Of the 230 distributed survey questionnaires, 180 were returned and 176 questionnaires were completed and usable for data analysis, showing an effective response rate of 77 percent.

#### 3.2 Construct Operationalization

The constructs and their measurement items are provided in Table 1. All items were measured on a seven-point Likert scale. The measurement items were developed primarily from existing scales. We constructed content-related tactics (four items), context-related tactics (four items), and social-related tactics (four items) by adapting items from Cable and Parsons' (2001) scale. In order to keep the survey as short as possible, we did not employ all of Jones' (1986) 30-item scale, but chose only the three-factor structure as an alternative to the original six-factor structure. For example, Cable and Parsons (2001) selected 12 items that loaded highest on each dimension of Jones' (1986) factors. We developed new scales for knowledge depth, breadth, and linkages based on existing literature, because there were no established scales available for individual level measurement. In line with past research (Santhanam et al. 2007), we developed a scale for knowledge depth (three items) covering the knowledge quality in areas related to core aspects of individual tasks, and knowledge breadth (three items) covering the knowledge range with respect to how peers use the system in other parts of the organization. Similarly, we developed a three-item scale for knowledge linkages based on Davis' (2013) measurement. Davis' (2013) original instrument was designed to capture the "access to special information" domain of IT competence at the individual level. We modified the items in light of our

<number>1</number><dates><year>1981</year></dates><isbn>0022-2437</isbn><urls></urls></record></Cite></EndNote>(Fornell & Larcker 1981), Sugree items (2007), whereas three items for extended application were adapted from Li et al. (Li et al. 2013) and Hsieh et al. (2007). In addition, to account for alternative explanations, we controlled for important factors that may affect knowledge application in ES assimilation, including age, system experiences, gender, personal IT innovativeness (three items) (Agarwal et al. 1998), and job specification (three items) (Liu et al. 2011).

Construct	Item Wording	Load- ing
Context- Related Tactics (CTX)	I have been extensively involved with peers in common ES related training activities.	0.883
	The firm puts all employees through the same set of ES related learning experiences.	0.798
	I have been through a set of training experiences which are specifically designed to give employees a thorough knowledge of ES related skills.	0.808
	I did perform my normal job responsibilities until I was thoroughly familiar with departmental procedures and work methods.	0.822
Social- Related Tactics (SCL)	Almost all of my colleagues have been supportive of me personally in learning ES.	0.859
	My colleagues have gone out of their way to help me adjust to ES.	0.859
	I am gaining a clear understanding of my role in ES from observing my senior colleagues.	0.721
Content- Related Tactics (CTT)	I have received little guidance from experienced members as to how I should perform my job in ES.	0.776
	Each stage of the training process has, and will, expand and build upon ES knowledge gained during the preceding stages of the process.	0.856
	This firm puts employees through an identifiable sequence of ES related learning experiences.	0.859
	The way in which my progress through ES will follow a fixed timetable of events has been clearly communicated to me.	0.907
Knowledge Breadth (KBRD)	Most of my ES related knowledge of what may happen to me in the future comes informally, through the grapevine, rather than through regular organizational channels.	0.849
	I understand the relationship among different components in ES.	0.897
	Besides my own job related knowledge, I also know ES knowledge of integrated processes in other parts of the organization.	0.938
Knowledge Depth (KDEP)	I have conceptual understanding of the whole system and system components	0.871
	Besides fundamental knowledge, I also have proficient understanding of how ES works.	0.777
	I know which aspect of ES does not fit for actual business needs	0.863
Knowledge Linkages (KLIK)	I know how to adjust technical components to meet business needs.	0.863
	Within the organization, I know who could help in ES related issues handling.	0.81
	Within the organization, I know where I could acquire valuable information about ES.	0.891
Habitual Application (HBA)	Out of the organization, I know where I could acquire valuable information about ES.	0.757
	Applying ES has become automatic to me when faced with a particular task.	0.925
	Applying ES is natural to me when faced with a particular task.	0.962
Extended Application (EXA)	Applying ES is an obvious choice for me when faced with a particular task.	0.882
	I have tried to apply most of ES features to support new business requirement	0.924
	I have tried to apply most of ES features to improve my work efficiency	0.937
Personal Innovativene ss (PIIT)	Besides the default features, I have tried to use different ES features to support my work.	0.894
	If I heard about a new information technology, I would look for ways to try it.	0.886
	Among my peers, I am usually the first to try out new information technologies.	0.916
Job Specification (JS)	I like to experiment with new information technologies.	0.872
	Compared with my peers, I am required to use the ES more frequently.	0.902
	Compared with my peers, my job responsibility makes me easier to reach system-related documentation and experiment with the ES.	0.94
	My job responsibility provides me high level of system authority, and thus makes me easier to learn and use the ES.	0.806

Table 1. *Constructs and associated items*

## 4 RESULTS

### 4.1 The Measurement Model

We chose SmartPLS 2.0 as the analytical software (Ringle et al. 2005) to assess both the measurement model and the structural model, as commonly practiced in IS literature. To validate our measurement model, all of the scales were examined for reliability and construct validity. The loadings of all items are greater than 0.6 (Table 1), and the values of composite reliability range from 0.861 to 0.946 (Table

2), which are higher than the benchmark level of 0.7 (Fornell et al. 1981). In addition, the average variance extracted (AVE) scores range from 0.65 to 0.853 (Table 2). They were equal to or above the recommended value of 0.5 (Fornell & Larcker 1981), suggesting that the indicators captured most variances in the constructs rather than denoting measurement errors.

	<i>AVE</i>	<i>CR</i>	<i>CA</i>	<i>MEAN</i>	<i>S.D</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>
CTT	0.751	0.924	0.892	4.94	1.7	0.867									
CTX	0.686	0.897	0.850	5.30	1.7	0.763	0.829								
SCL	0.650	0.881	0.822	5.52	1.3	0.512	0.500	0.806							
KDEP	0.698	0.874	0.783	4.92	1.6	0.358	0.342	0.364	0.835						
KBRD	0.814	0.929	0.886	5.03	1.5	0.526	0.471	0.550	0.731	0.902					
KLIK	0.675	0.861	0.756	5.41	1.5	0.575	0.552	0.560	0.468	0.625	0.821				
EXT	0.844	0.942	0.908	5.52	1.4	0.424	0.419	0.478	0.441	0.592	0.62	0.919			
HBU	0.853	0.946	0.913	5.71	1.3	0.316	0.341	0.436	0.488	0.597	0.475	0.700	0.924		
JS	0.782	0.915	0.861	5.54	1.5	0.458	0.507	0.351	0.472	0.606	0.543	0.623	0.666	0.885	
PIIT	0.795	0.921	0.876	5.01	1.4	0.396	0.267	0.352	0.377	0.373	0.303	0.465	0.326	0.268	0.892

Table 2. *Reliability, correlation coefficients and AVE results*  
*(The boldface values are the square roots of the average variance extracted for each construct. CR: Composite Reliability; CA: Cronbach's Alpha)*

Hence, the results indicate that the measurement items had good convergent validity. Discriminant validity can be supported by satisfying the following two criteria: First, the square roots of the AVE for each construct are larger than correlations with other constructs (Fornell & Larcker 1981); Second, item loadings on their own construct were significantly higher than the cross-loadings on any other construct (Chin 1998). In this study, we used the first criterion to evaluate the discriminant validity of the measurement model (in Table 2), and discriminant validity of the measurements is satisfactory.

#### 4.2 The Structural Model

Figure 3 presents the results of structural analysis using SmartPLS. Overall, the structured model explains 54.5% and 65.0% of the variances in the dependent constructs habitual application and extended application respectively, indicating strong explanatory power of the model. Among the five control variables, only personal innovativeness has a significant positive effect on extended knowledge application. In general, the research model is supported. Specifically, only 3 out of the 13 hypotheses were not supported by the data, and most of the core hypotheses were strongly supported at  $p < .01$  level.

Interestingly, the two hypotheses directly linking knowledge depth to habitual application and extended application are not supported. Our results show that knowledge depth does not have a direct impact on employee knowledge application, at least in the context of ES assimilation. However, knowledge depth strongly impacts knowledge breadth ( $\beta = 0.644$ ,  $p < .01$ ) and knowledge linkages ( $\beta = 0.303$ ,  $p < .01$ ). These results suggest that knowledge breadth and linkages play significant mediation roles on the relationship between knowledge depth and knowledge application (habitual application and extended application), and knowledge properties (breadth, depth, and linkage) mediate the relationship between socialization tactics and knowledge application, in ES assimilation context.

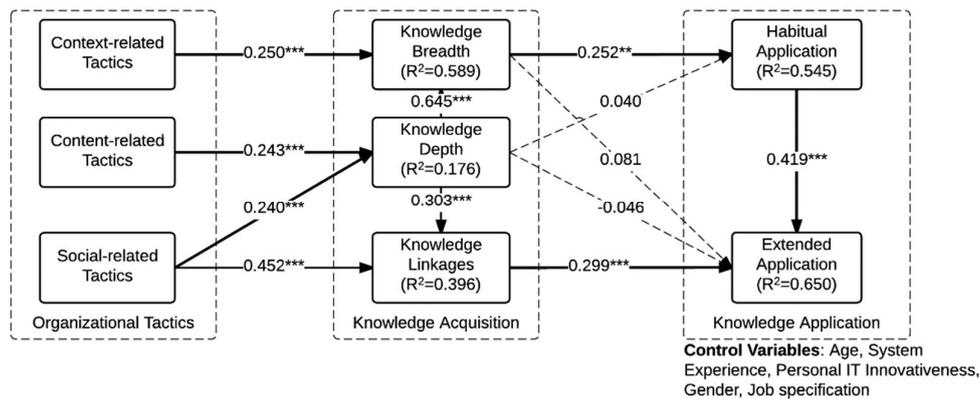


Figure 3. Structural model (\* at level  $p < 0.1$ ; \*\* at level  $p < 0.05$ ; \*\*\* at level  $p < 0.01$ . Dashed arrows indicate statistically insignificant relationships)

## 5 DISCUSSION AND CONCLUSION

Our study reveals interesting insights for understanding the intricate relationships between knowledge application behaviors and the properties of knowledge transferred in ES assimilation context, as well as for understanding the relationships among socialization tactics, knowledge transfer, and knowledge application in organizational settings at individual level. These findings provide a theoretical understanding of how management may improve inter-employee knowledge transfer through different socialization tactics.

Our findings offer important theoretical contributions to knowledge management and ES assimilation research. Knowledge management consists of knowledge creation, storage, transferring, and application (Alavi & Leidner 2001). In this study, we focus on knowledge transfer and application as they have the most direct impact on leveraging the benefits of the systems implemented. First, from a knowledge application perspective, we are among the first to identify habitual and extended knowledge application behaviors in the ES assimilation context. It enables us to make important conceptual distinctions between habitual and extended application in terms of their routinization or infusion. Our model also shows the critical roles of habitual application in stimulating extended application when employees engage in a more comprehensive set of work tasks that are beyond their routine tasks.

Second, from a knowledge transfer perspective, we introduced a multidimensional conceptualization of knowledge transferred in the ES assimilation context. As most research in this stream has been conducted at the organizational level, our empirical study helps enrich the understanding of knowledge properties at the individual level in ES context.

In addition, our findings also have implications for theoretical understanding of relationships between knowledge transfer and knowledge application behaviors in the ES assimilation context. With the refined conceptualization of habitual application and extended application and knowledge properties, we identified the differential influence of knowledge components on knowledge application behaviors. For example, we found that knowledge depth influences knowledge breadth and linkages, and but does not directly influence knowledge application. On the other hand, knowledge breadth and knowledge linkages have direct influence on habitual application and extended application respectively.

Finally, to the best of our knowledge, this is the first study that has empirically shown that the effect of different socialization tactics on employee knowledge transfer behavioral. Organizational intervention is a relatively broad construct that is expected to play a role in the ES assimilation context (Jaspersen et al. 2005). We adopted Van Maanen et al.'s (1979) socialization tactics framework to investigate intervention at a more fine-grained level. Our results suggest that the context dimension of socialization tactics is positively related to the breadth of knowledge transferred; the

content and social dimension of socialization tactics are positively related to the depth of knowledge transferred; and the social dimension is also positively related to knowledge linkages.

Our findings also have important implications for knowledge management practices. Training and management interventions are significant in ES post-implementation context because they allow the organization to benefit from previous learning and adjust to ongoing changes in the work system (Jaspersen et al. 2005). Managers should recognize the importance of continuing investing time, energy, information, and money in organization socialization tactics after ES has transitioned to the assimilation phase.

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