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Determinants of ERP implementation knowledge transfer

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ABSTRACT

Our study examined the determinants of ERP knowledge transfer from implementation consultants (ICs) to key users (KUs), and *vice versa*. An integrated model was developed, positing that knowledge transfer was influenced by the knowledge-, source-, recipient-, and transfer context-related aspects. Data to test this model were collected from 85 ERP-implementation projects of firms that were mainly located in Zhejiang province, China. The results of the analysis demonstrated that all four aspects had a significant influence on ERP knowledge transfer. Furthermore, the results revealed the mediator role of the transfer activities and arduous relationship between ICs and KUs. The influence on knowledge transfer from the source's willingness to transfer and the recipient's willingness to accept knowledge was fully mediated by transfer activities, whereas the influence on knowledge transfer from the recipient's ability to absorb knowledge was only partially mediated by transfer activities. The influence on knowledge transfer from the communication capability (including encoding and decoding competence) was fully mediated by arduous relationship.

1. Introduction

The worldwide market of ERP packages has been estimated as growing at an annual growth rate of 4.8% and exceeding $21 billion in 2010 [1]. According to the editorial in Information & Management [12], IS usage and resource management issues were most heavily investigating in the past decade, and knowledge management is an upcoming area.

Knowledge and the capability to create and utilize knowledge are important sources of a firm's sustainable competitive advantage. Globalization, M&A and strategic alliances have made effective knowledge transfer central to a firm's success. ERP implementation requires a wide range of knowledge. Without external help, hardly any organization can implement ERP successfully; external support is usually available from the software vendor. The benefits of ERP depend on the client's operation, maintenance, and upgrading skills and knowledge, which can be learned, acquired and transferred from a consultant.

Based on prior studies, Dong-Gil et al. [11] developed and examined an integrated theoretical model of knowledge transfer (from consultant to client) in the context of ERP implementation. Adopting a "source-recipient" model, they proposed that knowledge transfer was influenced by three types of factors: knowledge, communication, and motivational. However, they explored knowledge flow only from consultant to client, but knowledge flows in both directions. Gupta and Govindarajan [14] examined knowledge flows into and out of the subsidiaries of multi-national corporations (MNCs). Therefore, we developed and tested an integrated model to explore knowledge transfer between implementation consultants (ICs) and key users (KUs). There are two parts in the model: part one describes the ERP knowledge transfer from ICs to KUs, and the other the business knowledge from KUs to ICs. The knowledge exists at four levels: individual, group, organizational, and inter-organizational. We explored ERP knowledge transfer across organizations at the individual level.

2. Previous work

2.1. ERP implementation

Factor analysis and the process approach are two methodologies that have been used to explore ERP implementation [23]. The process approach attempts to explain how outcomes develop over time. Markus and Tanis [17] posited a four-phase framework: initial decision making, implementation, early use, and extended use. Nah et al. [19] identified 11 CSFs in ERP implementation. Somers and Nelson [28] also analyzed the key players and

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Table 1
Key players and key activities of ERP implementation

Authors	Key players				Key activities				
	Top management	User	Vendor	Consultant	PM	Software configuration and testing	BPR	Education and training	Effective communication
[19]	√	√		√	√	√	√	√	√
[38]	√	√	√		√	√	√	√	
[2]					√		√	√	√
[28]	√	√	√	√	√	√	√	√	√
[33]	√	√			√		√	√	
[24]		√						√	
[3]		√						√	√
[25]		√							√
[4]		√			√		√	√	

activities. Table 1 gives a summary. We explored the determinants of knowledge transfer between the two of the key players: the key user and the implementation consultant.

2.2. ERP knowledge

ERP is a configurable wide package that integrates processes within the organization in a shared database. Its success relies on the client's skills and knowledge of the ES.

ERP implementation requires knowledge of activities associated with configuring and testing ERP modules, installing software, and training employees in preparation for ongoing operation, maintenance, and support of a vendor-supplied system that is somewhat customized [10]. As a fulltime financial KU in an ERP implementation project, the first author took in-depth interviews with ICs and KUs and obtained deep insight into the knowledge needed for successful ERP implementation. We learned that a consultant who possessed experience in ES implementation could effectively support clients with necessary knowledge in ERP, project management and implementation methods while the client possessed the detailed knowledge of the firm's business processes, organizational context, and competitive situation. The knowledge from both sides could then be integrated into the implementation.

Table 2 shows the structure of ERP implementation knowledge.

2.3. Knowledge transfer

As knowledge exists at many levels in organizations, its transfer transcends the individual level to groups, departments, and divisions. Knowledge transfer becomes the process through which one unit is affected by the experience of another [5]. Thus we defined it as communication from a source so that it is learned and used by a recipient. In the initiation of a project, the ICs possess ERP knowledge and KUs business process knowledge. Effective implementation requires ICs to absorb business process knowledge from KUs and KUs learn ERP knowledge from ICs.

Table 2
ERP implementation knowledge

Players	Knowledge	Description
KUs	Business process	As-is business process
ICs	Theory of ERP management	Process-orient, information integration
	Methodology knowledge	Implementation methodology and tools, problem solution
	Technical knowledge	Know-how programming, operating, configuring and testing knowledge

3. Conceptual model and theoretical hypotheses

3.1. An integrated model of ERP knowledge transfer

Most knowledge transfer studies have focused on the source (its motivation, trust, and communication ability), recipient (its absorptive capacity, motivation, and communication ability), context (the transfer factors, such as project priority and maturity of the relationship), and knowledge nature (tacitness, articulability, specificity, complexity, teachability, and causal ambiguity). From semi-structure interviews, we proposed an overarching theoretical framework (see Fig. 1). Ten antecedents were hypothesized as predicting successful ERP implementation knowledge transfer.

3.2. Hypotheses

3.2.1. The characteristics of knowledge to be transferred

3.2.1.1. Causal ambiguity. Causal ambiguity concerns the lack of understanding of the logical linkages between actions and outcomes, inputs and outputs, and causes and effects. Simonin [26] highlighted the full-mediator role of ambiguity between knowledge transfer and factors such as tacitness, prior experience, complexity, and cultural and organizational distance. In a study of best practice transfer in firms, Szulanski [30] explored the relationship between causal ambiguity and unproven knowledge and found that causal ambiguity was one of the most important origins of stickiness (viz. impediments to knowledge transfer); it had a negative effect on knowledge transfer. Timbrell et al. [32] explored the stickiness origins of ES best practice transfer. In their study, causal ambiguity did not rank within the top 4 factors in any transfer phase. Consistent with prior studies, we posited that causal ambiguity reduced knowledge transfer:

H1a: Causal ambiguity has a negative effect on ERP knowledge transfer.
H1b: Causal ambiguity has a negative effect on business process knowledge transfer.

3.2.1.2. Tacitness. Polanyi [21] classified knowledge into two categories: explicit and tacit. Reed and DeFillippi [22] defined *tacitness* as the implicit and noncodifiable accumulation of skills that results from learning-by-doing. Using teachability, complexity, and codifiability to measure the tacitness of knowledge, Kogut and Zander [37] found that it increased the costs and decreased the speed of knowledge transfer. Unlike prior research, Cummings and Teng [9] highlighted the negative relationship between articulability (the extent to which knowledge could be verbalized,