Study on Knowledge Transfer Influence on ERP Implementation Performance from Inherent Angle of Enterprises

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Abstract: Based on ERP implementation performance indicator system and knowledge transfer from project team of ERP implementation to end-User, then developed an intra-enterprise knowledge transfer influence on ERP implementation performance model, the study conducts an empirical study to assess the model by using 356 questionnaires from China mobile, China Unicom and China telecom were collected. The empirical result shows that the encoding ability of project team, the receive aspiration of ERP knowledge and decoding ability of end-users, organizational incentive and the externalization of tacit knowledge can influence the effect of knowledge transfer positively; effect of knowledge transfer can make positive influence on ERP implementation performance. Finally, some managerial implications are provided.

Key words: Knowledge transfer, ERP implementation performance, intra-enterprise, SEM

INTRODUCTION

Enterprise Resource Planning (ERP) is used as a powerful Information System (IS) by companies, such as for handling complicated business applications. Some companies improve operational efficiency and business efficacy by the ERP (Gattiker and Goodhue, 2005; Ke and Wei, 2008; Liang *et al.*, 2007; Wang and Chen, 2006). And ERP can improves operational efficiency by integrating business processes and providing better access to integrated data across the entire enterprise while to enhance efficacy, a company may redesign its business practices by using the templates (or best practices) embedded in the ERP (Davenport, 1998; Lucas *et al.*, 1988). All efficiency and efficiency depends on successful ERP implementation. ERP implementation involves selecting an ERP software system and a cooperative vendor, implementing the selected system, managing business processes change and examining the practicality of the adopted ERP system (Wei and Wang, 2004). It is a revolutionary transformation of enterprise development and needs total involvement. Therefore effective knowledge transfer can make ERP implementation progress smooth. An ERP application is an enterprise-wide package that tightly integrates all necessary business functions into a single system with a shared database. An ERP implementation often entails transferring the business knowledge incorporated in the basic architecture of the software package into the adopting organization (Lee and Lee, 2000). As a result,

study on knowledge transfer influence to ERP implementation performance has become an important topic. In order to ensure combination of ERP system and the enterprise internal business processes, the enterprise is often established an ERP implementation project team, including top management, business backbone in charge of business department or composition, who not only are familiar with their own department business, but also know other relevant departments relationship. ERP knowledge transfer involves two processes: from implementation consultants to the enterprise project team and from the enterprise project team to ERP system end-users which is shown as Fig. 1.

Based on prior studies, Dong-Gil *et al.* (2005) developed and examined an integrated theoretical model of knowledge transfer (from consultant to client) in the context of ERP implementation and explored knowledge flow only from consultant to client, but knowledge flows in both directions. Gupta and Govindarajan examined knowledge flows into and out of the subsidiaries of multi-national corporations. Xu and Ma (2008) developed and tested an integrated model to explore knowledge transfer between implementation consultants and key users.

Therefore we study knowledge transfer influence on ERP implementation performance from inherent angle of enterprises. We established a model to explore knowledge transfer between the enterprise internal ERP implementation project team to ERP system end-users. Data to test this model were collected 356 questionnaires from China mobile, China Unicom and China telecom. The

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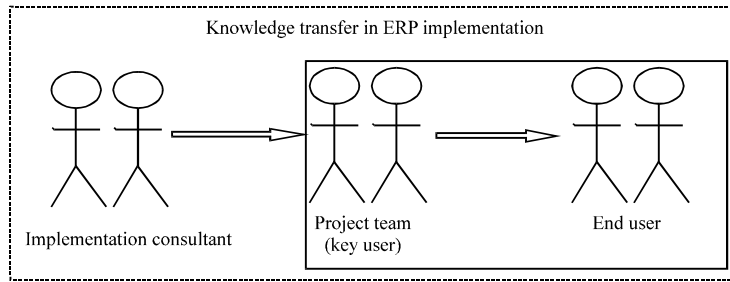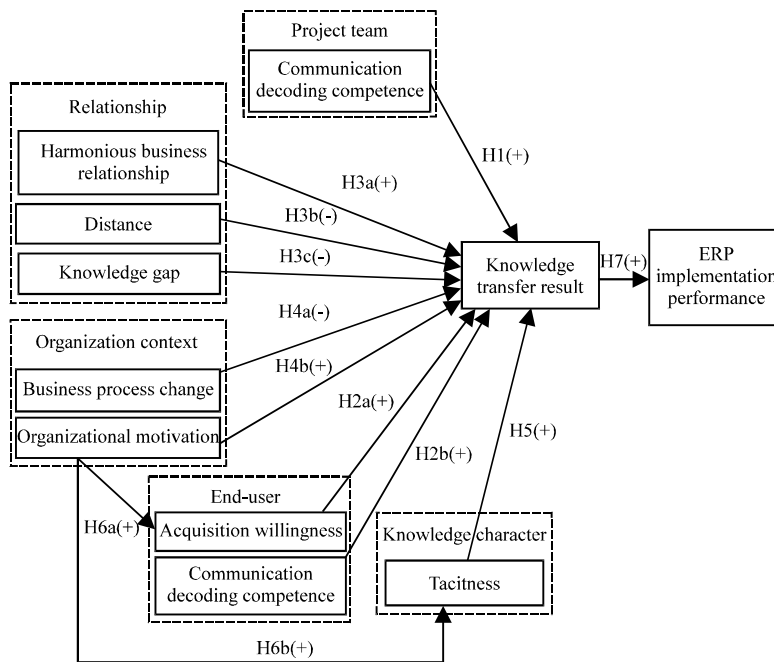
Fig. 1: ERP implementation knowledge transfer

Fig. 2: study model

results of the analysis demonstrated that all four aspects had a significant influence on ERP knowledge transfer. Furthermore, we gave the corresponding managerial implications.

STUDY MODEL AND HYPOTHESIS DEVELOPMENT

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. Most knowledge transfer studies have focused on the source, recipient, context and knowledge nature. From

prior studies and the reality of the telecom enterprises, we proposed an overarching theoretical framework which is shown as Fig. 2.

Knowledge transfer becomes the process through which one unit is affected by the experience of another (Argote and Ingram, 2000). In our study, the ERP implementation project team possesses ERP knowledge. Effective implementation requires ERP system end-users to absorb ERP knowledge from the team. Nine antecedents were hypothesized as predicting successful ERP implementation knowledge transfer, ERP implementation knowledge transfer acted as a mediator between ERP implementation performance and factors like knowledge gap and communication decoding competence of ERP end-users etc; also that acquisition willingness a

mediator between organizational motivation and knowledge transfer, tacitness was a mediator between organizational motivation and knowledge transfer. Based on the model, we propose the following study hypotheses:

H1: Communication encoding competence of ERP implementation project team has a positive effect on ERP knowledge transfer

H2a: Acquisition willingness of ERP end-users has a positive effect on ERP knowledge transfer

H2b: Communication decoding competence of ERP end-users has a positive effect on ERP knowledge transfer

H3a: Harmonious business relationship between ERP implementation project team to ERP system end-users has a positive effect on ERP knowledge transfer

H3: Distance between ERP implementation project team to ERP system end-users has a negative effect on business process knowledge transfer

H3c: Knowledge gap between ERP implementation project team to ERP system end-users has a negative effect on ERP knowledge transfer

H4a: Business process change has a negative effect on ERP knowledge transfer

H4b: Organizational motivation has a positive effect on ERP knowledge transfer

H5: Tacitness has a negative effect on ERP knowledge transfer

H6a: Organizational motivation has a positive effect on acquisition willingness of ERP end-users

H6b: Organizational motivation has a positive effect on explicit knowledge

H7: ERP knowledge transfer has a positive effect on ERP implementation performance

ERP implementation performance was selected as dependent variable and knowledge transfer was selected as intermediary variable in the model. ERP implementation knowledge was composed of theory of ERP management, methodology, technical knowledge and business process. ERP implementation performance is used as a standard to measure whether ERP application was successful and how ERP application brought benefits to the enterprise. ERP implementation performance was measured by system quality, information quality, user satisfaction and use (Nonaka, 1994). We defined ERP implementation performance standard as each module of ERP system application successful, user satisfaction, management scope enlarge, office automatization.

Independent variables in the model were communication encoding competence of ERP implementation project team (Swan *et al.*, 1999), acquisition willingness of ERP end-users, communication decoding competence of ERP end-users (Dutton and Starbuck, 1979), harmonious business relationship, distance, knowledge gap, business process change (Ni and Lin, 2011), organizational motivation (Simonin, 1999), tacitness (Cummings, 2002; Guan, 2010; Jie *et al.*, 2011). All the 11 factors to be measured were primarily those found and validated in prior studies. Multi-item scales were developed for each variable; most used seven-point Likert-type interval scales ranging from 'to very little extent' to 'to very large extent'.

EMPIRICAL STUDY

Descriptive statistic analysis: In our study, we analyzed sample characteristics and demographic characteristics of enterprises by SPSS17.0, statistic form of basic situation and workers surveyed is shown as Table 1.

Table 1: Description of sample distribution

Measure	Items	Freq.	Percentage
Gender	Male	186.0	58.86
	Female	130.0	41.14
Age	≤25	36.0	11.39
	26-30	99.0	31.33
	31-35	103.0	32.59
	36-40	55.0	17.41
	≥40	23.0	7.28
Position	Director	18.0	5.70
	Manager	91.0	28.80
	Chief employee	120.0	37.97
	Employee	79.0	25.00
Degree	Under college	8.0	2.53
	College	43.0	13.61
	Bachelor	170.0	53.80
	Master	91.0	28.80
	Doctoral or above	4.0	1.27
Salary (yuan month⁻¹)	≤2000	23.0	7.28
	2001-4000	89.0	28.16
	4001-6000	125.0	39.56
	6001-8000	69.0	21.84
	≥8001	10.0	3.16
Company size	China mobile Ltd.	130.0	41.14
	China unicom	95.0	30.06
	China telecom		
Corp Ltd.,	91	28.8	
	2000-2999	93.0	29.43
	3000-3999	101.0	31.96
	4000-4999	30.0	9.49
	≥5000	15.0	4.75
	≤1	41.0	12.97
	1-2	83.0	26.27
	2-3	75.0	23.73
	3-4	69.0	21.84
	4-5	30.0	9.49
	≥5	18.0	5.70
ERP modules	Financial management	316.0	100
	Human resource		
management	306	96.84	
	Logistics management	265.00	83.86
	Project management	209.00	66.14
	Business intelligence	172.00	54.43
	Others	20.00	6.33

From Table 1, we can find that sample data distribution was consistent with ERP application characteristics of Chinese telecommunication. Therefore, the survey data of our study was credible.

Questionnaire reliability and validity analysis: The reliability and validity of measurement for each construct was tested by using exploratory and confirmatory factor analysis based on the 356 samples collected from China mobile, China Unicom and China telecom. The resulting scales were then evaluated for reliability using Cronbach's α. All but one had acceptable reliability ($a>0.70$). The results are shown in Table 2.

Structural equation analysis: Confirmatory factor analysis was performed with AMOS 17.0 and then we measured all 11 variables which are communication encoding competence of ERP implementation project team, acquisition willingness, communication decoding competence of ERP end-users, harmonious business relationship, distance, knowledge gap between ERP implementation project team to ERP system end-users, business process change, organizational motivation, tacitness, ERP knowledge transfer, ERP implementation performance.

The fit of the overall structure model was estimated by various indicators. The ratio of χ^2/df was 1.37 which was within the recommended value of 3. RMSEA showed the discrepancy between the proposed mode and the

population covariance matrix, to be 0.0737 which was lower than the recommended cut-off of 0.08. All other indicators exceeded the commonly acceptance levels (0.90) (CFI = 0.93, IFI = 0.91, TLI = 0.91), all provided evidence of a good model.

Thus, we could proceed to examine path coefficients of the structural model. This involved estimating the path coefficients and R2 value. Path coefficients indicated the strengths of the relationships between the independent and dependent variables, whereas the R2 value was a measure of the predictive power of a model for the dependent variables. The overall results of SE analysis are shown in Fig. 3.

Path coefficients between the independent and dependent variables and significant results are shown in Table 3.

The overall analysis results are seen from Fig. 3 and Table 3. As hypothesized, ERP implementation performance is significantly associated with knowledge transfer results (path coefficient = 0.502, p<0.01), knowledge transfer results is significantly associated with organizational motivation (path coefficient = 0.476, p<0.01), communication encoding competence (path coefficient = 0.329, p<0.01), communication decoding competence (path coefficient = 0.315, p<0.01), business process change (path coefficient = -0.299, p<0.01), tacitness (path coefficient = 0.294, p<0.01) and acquisition willingness (path coefficient = 0.262, p<0.07). All seven paths have effects in the direction hypothesized and Hypotheses 1, 2a, 2b, 4a, 4b, 5 and 7 are, therefore, supported. However, three independent variables-harmonious business relationship, distance and knowledge gap-have no significant effect on knowledge transfer result. Thus, Hypotheses 3a, 3b and 3c are not supported.

As shown in Fig. 3 and Table 3, organizational motivation (path coefficient = 0.256, p<0.09) significantly influence taciness and providing support for hypotheses 6a. Contrary to expectations, organizational motivation did not significantly affect acquisition willingness. Thus, Hypothesis 6a is not supported.

Table 2: Results of questionnaire reliability and validity analysis

Variable	α	KMO	Explained variance (%)
Communication encoding competence	0.778	0.775	60.952
Acquisition willingness	0.611	0.657	75.670
Communication decoding competence	0.816	0.645	73.380
Harmonious business relationship	0.772	0.714	59.563
Distance	0.843	0.713	76.264
Knowledge gap	0.704	0.638	62.879
Business process change	0.881	0.682	72.631
Organizational motivation	0.807	0.618	72.349
Tacitness	0.810	0.760	64.797
Knowledge transfer result	0.701	0.652	62.978
ERP implementation performance	0.750	0.725	76.327

Table 3: Description of sample distribution

| Relationship between variables			Path coefficient	Significance
ERP implementation performance	<---	Knowledge transfer result	0.502	***
Knowledge transfer result	<---	Organizational motivation	0.476	***
Knowledge transfer result	<---	Commnnication encoding competence	0.329	***
Knowledge transfer result	<---	Commnnication decoding competence	0.315	***
Knowledge transfer result	<--	Business process change	-0.299	***
Knowledge transfer result	<--	Tacitness	0.294	***
Knowledge transfer result	<---	Acquisition willingness	0.262	0.07
Knowledge transfer result	<--	Harmonious business relationship	0.153	0.204
Knowledge transfer result	<--	Distance	-0.109	0.261
Knowledge transfer result	<--	Knowledge gap	-0.087	0.362
Tacitness	<--	Organizational motivation	0.256	0.09
Acquisition willingness	<--	Organizational motivation	0.143	0.215

Comment: ***shows very significant, p<0.01
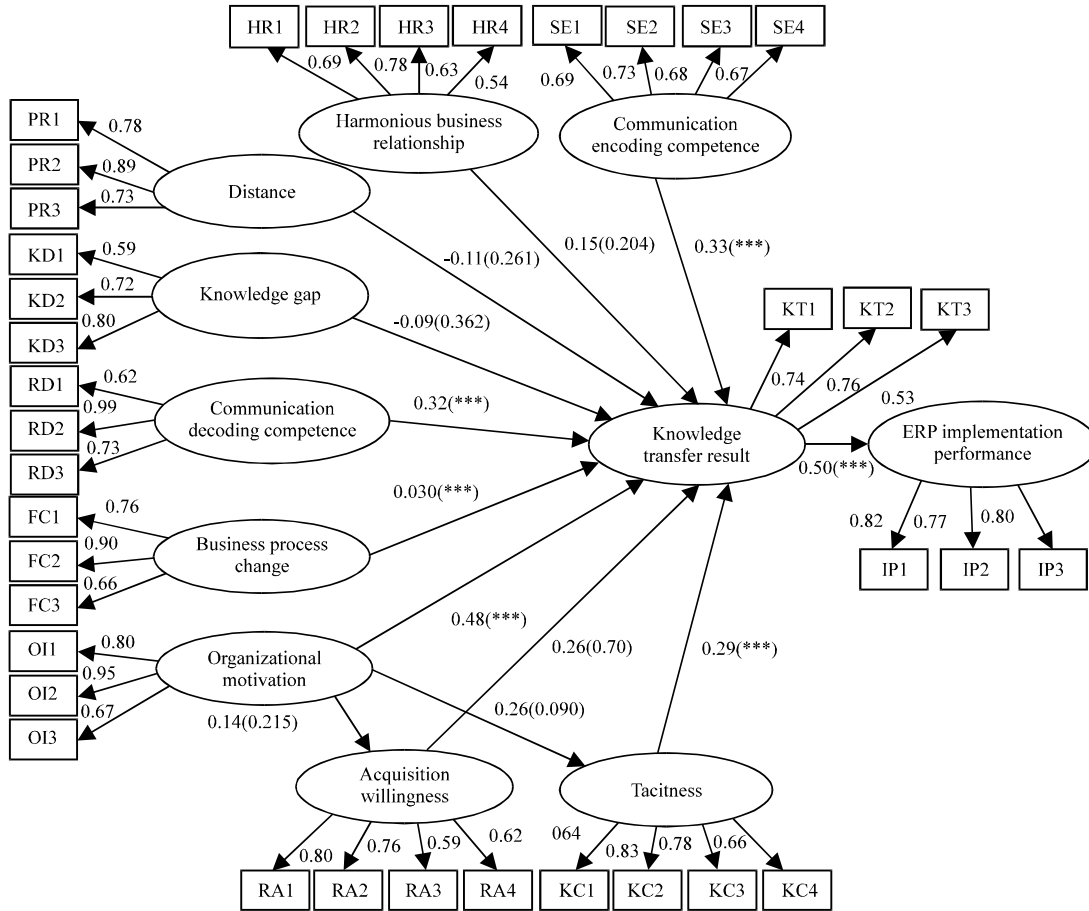
Fig. 3: Results of SE analysis

Table 4: Results of hypothesis testing

Hypothesis	Results
H1: Communication encoding competence of ERP implementation project t team has a positive effect on ERP knowledge transfer.	Supported
H2a: Acquisition willingness of ERP end-users has a positive effect on transfer activities in business process knowledge transfer.	Supported
H2b: Communication decoding competence of ERP end-users has a positive effect on ERP knowledge transfer.	Supported
H3a: Harmonious business relationship between ERP implementation project team to ERP system end-users has a positive effect on ERP knowledge transfer.	Not supported
H3b: Distance between ERP implementation project team to ERP system end-users has a negative effect on business process knowledge transfer.	Not supported
H3c: Knowledge gap between ERP implementation project team to ERP system end-users has a negative effect on business process knowledge transfer.	Not supported
H4a: Business process change has a negative effect on business process knowledge transfer.	Supported
H4b: Organizational motivation has a positive effect on ERP knowledge transfer.	Supported
H5: Tacitness has a negative effect on ERP knowledge transfer.	Supported
H6a: Organizational motivation has a positive effect on acquisition willingness of ERP end-users.	Not supported
H6b: Organizational motivation has a positive effect on explicit knowledge.	Supported
H7: ERP knowledge transfer has a positive effect on ERP implementation performance.	Supported

Table 4 provides a detailed summary of all the hypotheses test results.

CONCLUSION AND MANAGERIAL IMPLICATIONS

Conclusion: Before providing some implications, some of its limitations must be discussed. The first limitation is from examining knowledge transfer in only one direction, from ERP implementation project team to ERP system end-users. Knowledge may also transfer from ERP system end-users to ERP implementation project team; however, this was beyond the scope of this study and is left for future study. A second limitation concerns that the sample is confined to China Telecom industry. The third

limitation is the relatively small sample size. Our sample size of 356 compares well with other matched-pair studies.

This study examined the antecedents of knowledge transfer from ERP implementation project team to ERP system end-users and knowledge transfer how to influence on performance within enterprises information system implementation context and using an integrated theory that posits that five sets of factors-knowledge source, recipient, character, relationship and organization context-influence knowledge transfer. Then we developed an intra-enterprise knowledge transfer influence on ERP implementation performance model and conducted an empirical study to assess the model by using 356 questionnaires from China mobile, China Unicom and China telecom were collected. The empirical result shows that the encoding ability of project team, the receive aspiration of ERP knowledge and decoding ability of end-users, organizational incentive and the externalization of tacit knowledge can influence the effect of knowledge transfer positively; effect of knowledge transfer can make positive influence on ERP implementation performance.

The results extend, augment and apply prior study to an increasingly important and extensive ERP context. Since, these are the most important and most complex information systems with which organizations deal, there is a real need for an integrated theory for this domain. Given that the knowledge asymmetry and knowledge barrier issues, are endemic to much of the IS implementation world, such a model may have far-reaching application. In sum, this study contributes to theory and practice by focusing on knowledge transfer influence on ERP implementation performance from inherent angle of enterprises.

Managerial Implications: This study provides guidance for the increasing number of ERP systems that are being implemented inherent angle of enterprises. It is important because ERP implementation performance lies on ERP implementation results which increasingly is directly influenced by knowledge transfer in organizational. The results of our study suggest some implications for corporate executives. Those managerial implications are provided as follows.

First, what the implications of these results showed is that it is very significant for project personnel selection. So it is necessary for corporate executives to establish scientific selection mechanism and training mechanism before building ERP implementation project team. The project personnel must have ERP implementation experience, communication coding skills, etc. On the project personnel side, a good knowledge of business and general interpersonal skills, as well as quick learning and previous experience at the similar tasks will enhance project success. Perhaps the project personnel can conceptualize the overall transfer process in two stages: First, from consultants to the most knowledgeable business people and then second, from them to the ERP system end-users.

Secondly, the implications of our study are simplification of communication and learning form. The relationship between communication encoding competence and knowledge transfer is mediated by shared understanding. This suggests that an ERP implementation project team member's ability to express ideas clearly, have a good command of the language and be easily understood by the ERP end-users who will maintain and operate the systems independent of the consultants and the team. In the process of training and guidance, ERP implementation project team must adjust communication and learning form by ERP end-users knowledge digestion and absorption ability.

Thirdly, establish constructing sharing information mechanism is important (Chen and Liu, 2012). It is important to exploit modern information technology to share ERP knowledge then tacit knowledge coding became possible. As such, the results suggest that it is important to form a good learning culture and strengthen organization motivation in order to make tacit knowledge explicit.

Fourthly, intrinsic motivation was found to be more important than extrinsic motivation. When the enterprise business processes are consistent with the advanced ERP system, business process change in enterprise must suit with the end-users interests through leader commitment and organizational incentives to boost the end user confidence in ERP implementation. In other words, extrinsic motivators may not aid in effectively transferring knowledge; rather, intrinsically motivated individuals are needed to go the extra mile when necessary, especially when tacit knowledge which is so prevalent in complex implementation projects, is involved.

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