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Relationship bonding for a better knowledge transfer climate: An ERP implementation research

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ABSTRACT

While prior studies on ERP implementation have largely focused on the importance of best practices, the purpose of this paper is to examine the impact of the knowledge transfer climate and relationship bonding. The model categorizes the factors that influence the result of knowledge transfer during ERP implementation into three types: those implemented by the firm, those implemented by the consultant, and those related to the impact of the knowledge transfer climate. The bonding factors from the two former aspects facilitate the building of a better knowledge transfer climate. A total of 174 respondents are surveyed with results subjected to multivariate analysis. The significance of bonding factors is verified, and the role that the knowledge transfer climate plays in the knowledge transfer process and the impact on the transfer process are developed. This paper provides a broader, richer model of knowledge transfer networks to promote insight into successful ERP implementation. In practice, the key to effective knowledge transfer is the establishment of a positive knowledge transfer climate. To achieve a successful ERP implementation, practitioners should focus on developing a positive relationship with ERP implementation partners.

1. Introduction

Enterprise resource planning (ERP) is a powerful and sophisticated software package supporting a wide range of organizational transaction information and processes [62]. In comparison with traditional information systems, the major difference of ERP lies in its power to provide integrated and streamlined internal information to synergize work in the supply chain for businesses to create new competitive advantages [14,24,77,87]. Improper implementation of ERP, on the other hand, can cause considerable trouble for the implementing companies [65]. Therefore most companies rely on external consultants and best practices to assure successful implementation [12,21,26,38, 62,90].

However, even the use of consultants and best practices does still not guarantee success. Recent studies reported that the failure rate of ERP projects still exceeds 50%, even when supported by consultants and following best practices [39,54,94]. This indicates that something is missing from the whole picture of successful ERP implementation. From a knowledge learning perspective, Ko et al. [50] suggested that the main reason for this high failure rate is the complexity of restructuring unique logistics operations by the implementing firm, as well as the adoption of a new system.

Members of an ERP implementation project team, composed of staff from the implementing firm and consultants, bring different levels of understanding of current processes and the system to be implemented. Therefore, a prerequisite to a successful ERP implementation is to ensure that all team members have certain key knowledge. For example, once a firm has decided to implement an ERP system, the firm's staff needs to learn from the consultants the skills required to operate this new system; the consultants also need to map the firm's existing organizational processes to configure the system to suit the particular organizational context [50,61,68]. Hence, a successful ERP project may not assured by the implementation of best practices alone, and the degree of knowledge transfer between those two participating parties is also critical.

How high a degree of knowledge transfer can be achieved between stakeholder parties? Prior studies in social exchange theory proposed that, when different parties seek to exchange proprietary information to accomplish a common goal, a basic premise is a consensus of willingness to exchange [10,50,68,95]. Moreover, prior studies in knowledge management theory noted that a positive learning climate makes participants willing to share their knowledge and plays an important antecedent role for a high degree of knowledge transfer [13,15,28,76].

Based on previous discussions, this paper proposes that a positive knowledge transfer climate may be a necessary condition to enable a

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high degree of knowledge transfer, so as to achieve a successful ERP implementation. In addition, through relationship bonding theory, this paper explores the factors that promote or inhibit a positive knowledge transfer climate. The research questions are presented as follows.

1. How does the knowledge transfer climate affect the outcome of ERP knowledge transfer?
2. What conditions are required to foster a positive knowledge transfer climate?

The rest of the paper is organized into five sections. The next section reviews the literature on knowledge transfer in ERP implementation and the factors affecting the outcome of knowledge transfer. It then presents and develops a literature-based framework and hypotheses for explaining how the knowledge sender and receiver influence the outcome of knowledge transfer. The subsequent section describes the research methodology used to test the proposed hypotheses, and is followed by presentation of the data analysis and results. Finally, this paper discusses the research contributions and implications for both academics and practitioners.

2. Literature review and hypotheses

This section presents an overview of knowledge transfer in ERP implementation, reviews related theory and derives hypotheses. The transfer climate is then discussed, followed by an illustration of the role of relationship bonding in the research. Fig. 1 depicts the cause and effect model and corresponding hypotheses.

2.1. Knowledge transfer in ERP implementation

The major purpose of ERP is to integrate a wide range of information regarding organizational resources to create synergies with business partners, meet customer requirements, and enhance operational performance [8,21,37]. For several decades, ERP implementation literature has been dominated by experimental work emphasizing proper steps and procedures [12,21,23,26,38,62,90].

A great number of prior studies, however, have found that the failure rate for ERP implementation is still abnormally high. In certain cases, ERP implementation even threatened the sustainability of organizations [37,39,51,58]. More recent studies have observed that an ERP system is not just software to be tailored to an organization, but an organizational infrastructure that affects how an organization's processes are structured [78,95,96]. Therefore, researchers and practitioners have shown a growing interest in how an organization implements ERP systems through different perspectives. Several researchers have noted that the core issues in ERP implementation failure could be explored from a knowledge perspective [60,79,89]. They argued that implementing ERP requires a firm to map key knowledge from the current system to the new system to ensure a good fit with its current business logic [53,57]. For example, during the implementation process, consultants must provide relevant knowledge because the firm lacks internal knowledge about ERP systems. On the other hand, the consultants also need the implementing firm's collaboration to make sense of the firm's characteristics or specific production processes so as to tune the system and to ensure a best fit [33,50].

As participants in ERP implementation begin to recognize the importance of knowledge transfer, the focus of ERP implementation changes as well. Knowledge transfer (KT) is defined as "how knowledge acquired in one situation applies to another" [80]. In organizations, it is the process through which one unit is affected by the experience of another. Firms that are effective in transferring knowledge from one unit to another are reckoned to be more productive and profitable [6,18,22,56]. Lin et al. [60] expanded this perspective to include sender–receiver game literature from information economics. According to their viewpoint, knowledge can be seen as a valuable asset held by individuals. Those who possess knowledge can leverage it to create benefits for themselves.

In the case of ERP implementation, consultants, who have the knowledge required to operate the new system, will be the knowledge sender and, ideally, endeavor to earn rewards by transmitting the related knowledge to the knowledge receiver – the implementing firm [18,66]. Hence, the key to a successful ERP implementation is no longer merely the duplication of best practices, but also the facilitation of knowledge transfer between the implementation participants.

2.2. Knowledge transfer climate in ERP implementation

A growing body of research has proposed that new IT implementation is a matter of communication and uncertainty reduction [33,40], and should require investigation of the knowledge transfer flow between the participating parties [30,31,55,57,89]. This approach emphasizes the

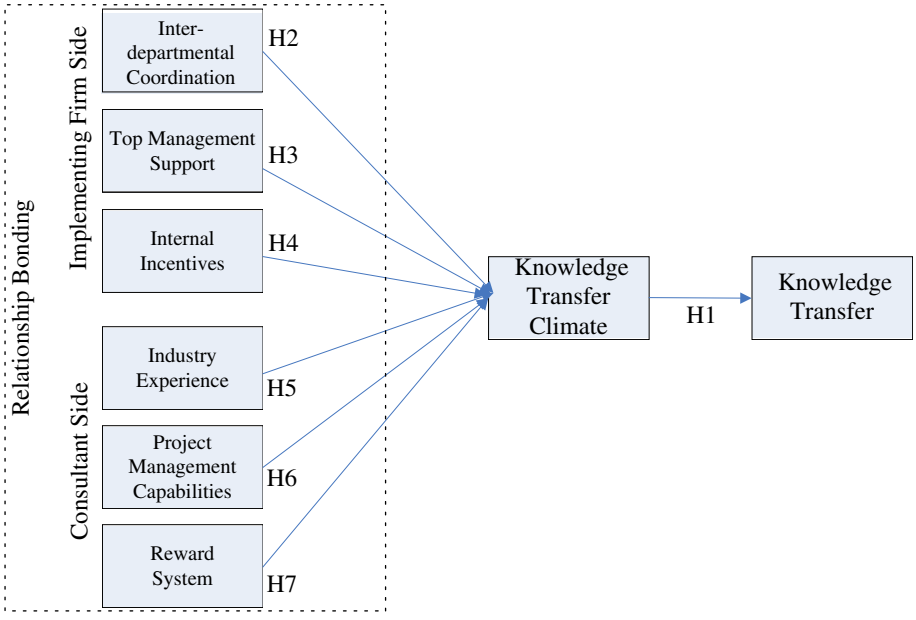

Fig. 1. ERP knowledge transfer model.

value of knowledge transfer during implementation processes, and can elicit more fruitful knowledge than conventional IT implementation studies that promote implementation processes as a series of sequential best practice steps. However, most research addressing knowledge transfer in ERP implementation merely describes case studies or, at most, explores a few influential factors. Although many authors have claimed that successful knowledge transfer should increase the likelihood of success in ERP implementation, few have proposed a mechanism for successful knowledge transfer. In an effort to bridge this gap, Bock et al. [10] proposed a knowledge transfer climate (KTC), referring to a contextual situation at a point in time and its linkages to the thoughts, feelings, and behaviors between participants. They noted that establishing a climate where the participants are willing to share and receive knowledge is critical to the successful transfer of knowledge.

Researchers have been advocating the concept of KTC in the domain of knowledge management for decades. Nonaka and Konno [69] urged a need to create a climate they refer to as "Organizational Ba" that promotes interaction and willingness to exchange knowledge. Lin et al. [60] proposed that creating a healthy climate between knowledge senders and receivers is critical for successful KT. Prior studies found that members are more willing to transfer knowledge in a climate in which they are engaged in a common goal, benefit from common association, and have a feeling of fair exchange [19,20,32,35,36,67]. The ERP literature also focuses on the role of climate as a facilitator. Ko et al. [50] and Gattiker and Goodhue [30,31] revealed that, if the client and consultant feel they are drifting apart and do not have same work values, norms, and attitudes, it will be difficult to realize knowledge sharing and transfer. A consequent and commonly accepted assumption is that KTC is a principal factor in facilitating successful knowledge transfer [19,32,35,67].

In sum, a positive knowledge transfer climate supports the process of knowledge transfer between participants in ERP implementation and helps achieve an effective and positive implementation outcome. Thus, our first hypothesis is designed to examine whether the formation of a positive KTC will influence the effect of knowledge transfer:

H1. The knowledge transfer climate has a positive impact on the effect of knowledge transfer.

2.3. Relationship bonding in ERP implementation

As identified in prior studies, the more positively participants perceive the climate to be, the greater their intention to share knowledge. The consequent question is: What factors lead participants to form a positive climate for sharing their own knowledge assets? Newell et al. [68] took a case study approach in examining an ERP project team from a social exchange perspective and found that, when a project team could not cultivate strong bonds the knowledge transferred from one individual to another would be limited, possibly resulting in the failure of the project. On the other hand, researchers have also proposed that the disruption of a bond is likely to cause serious trauma in knowledge sharing [1,68,73]. Kim et al. [48] believed that conflict between parties and destruction of relationship bonds would bring out a negative force, leaving members unwilling to transfer knowledge. Their findings provided clues for achieving a positive knowledge transfer climate.

Bonding has long been of interest in behavioral science. Bonding refers to the strength or depth of a relationship between people which endures over time, and which entails considerable vulnerability to the parties involved [7,68]. Han [34] defined "bonding" as the degree to which certain ties link and hold participants in an economic, strategic, and organizational sense. Mattson [63] claimed that business-to-business relationship bonds take different forms: technical, time-based, knowledge-based, social, economic and legal. Among these, time-based bonds occur as a result of required interorganizational coordination of some activity, e.g., coordination between a firm and its consultants during ERP implementation. Knowledge-based bonds are based on experiential learning as participants get to know each other's special characteristics, e.g., industry context or unique operational processes. Social bonding is found in interpersonal relationships between partners, e.g., the relationship of a consultant and client in the context of system implementation. Social bonding can be strengthened through high-level managerial support and various multi-level contacts between organizations. Economic bonding could be encouraged through rewards or incentives to the participants.

The perspective on bonding factors could also differ with participant roles. The collaboration of people in different roles helps nurture a knowledge transfer climate between organizations. For example, Xu and Ma [93] explored the determinants of knowledge transfer between two key roles: the key users in the implementing firm and the implementation consultants. They found that a positive context among the key users contributes to successful knowledge transfer in ERP implementation. The same is true for a positive context among the consultants, and their project management skills will help form an overall positive context which will raise the willingness to transfer knowledge between the two groups.

Helo et al. [35] examined the ERP implementation process from the consultants' viewpoint, and concluded that greater interaction among departments in the implementing firm can lead to greater interdepartmental conflict, and thus decrease the likelihood of successful implementation. Therefore, big projects like ERP implementation benefit from top-down authorization to reduce internal resistance.

In practice, the implementing firm may be regarded mainly as a knowledge recipient and the consultant may be regarded as a knowledge provider. From a knowledge recipient's perspective, the implementing firm needs to be aware of bonding factors such as interdepartmental coordination, top management support, and internal incentives [50,61,89,96]. From a knowledge provider's perspective, the consultant needs to pay attention to bonding factors such as industry experience, project management capabilities, and reward systems [27,44,64,68,72,79,85,89]. The following subsections discuss the previous findings on bonding factors from the respective viewpoints of the implementing firm and the consultant, and propose correlative hypotheses for each.

2.3.1. Implementing firm side factors

The first factor relating to the implementing firm side is interdepartmental coordination. Since a successful ERP implementation requires coordination across different functional areas, research has suggested that forming a positive interdepartmental link could raise the motivation of participants to effectively exchange knowledge [44,59]. Kim et al. [48] found that conflict between departments will create a negative climate that makes members unwilling to share knowledge, and this must be solved through proper management. Forming strong relationship bonds for interdepartmental coordination is crucial to resolving such conflicts, and is one of the factors that affect the formation of the knowledge transfer climate [36,68,91]. Based on these findings, this research sets the second hypothesis as follows:

H2. Interdepartmental coordination within the implementing firm has a positive impact on the knowledge transfer climate.

Top management support is the second factor relating to the implementing firm. Previous research reveals how managerial attitudes affect end user acceptance of new systems [25,44,59,85,89]. For example, McLachlin [64] pointed out that, in promoting the adoption of a new system within an organization, top management should understand the functions and limitations of the project, initiate the implementation of the new system, and explain the managerial strategies to employees. Kim et al. [48] proposed that proper management

structure is able to stimulate coordinated bonding. Thus the third hypothesis:

H3. Top management support within the implementing firm has a positive impact on the knowledge transfer climate.

The third factor relating to the implementing firm side is internal incentives. Comprehensive knowledge of the implementing firm's unique business process for configuring a new ERP system can be found not only in documents, but also in individual employees. Prior studies have shown that internal staff might be reluctant to share their own knowledge with others, and this will result in the failure of knowledge transfer [42,74,82,83,88]. Grounded in social learning theory, Kettinger and Grover [47] believed that people will change their behavior if they understand how they can reap reward or punishment from it. That is, incentives can trigger knowledge-sharing [9,50]. Venkatesh [86] believed that providing incentives in the training stage can significantly increase user recognition of the information systems (IS). ERP implementation requires knowledge from both the implementing firm and consulting firm, thus it is necessary to formulate incentives to stimulate the establishment and maintenance of KTC. Thus the fourth hypothesis:

H4. The implementing firm's internal incentives have a positive impact on the knowledge transfer climate.

2.3.2. Consultant side factors

The first factor relating to the consultant side is industry experience in terms of whether the consultants have experience similar to those of the firm implementing ERP. Newell et al. [68] analyzed a case of ERP implementation in the UK and found that consultants needed to map existing processes and the functions of new system to fit a new ERP system into a particular organization. According to Kumar et al. [52], the consultant's industrial knowledge is an important consideration for a potential client, especially to one that urgently requires business process reengineering. Lee et al. [57] also pointed out that a consultant's industry experience has a significant influence on the success of knowledge transfer. If the consulting team has relevant experience in the industry, it could more easily make sense of the implementing firm's unique business logic, using that experience as a point of reference [9,50]. For example, given similar industry experience, participants would have more shared values and greater mutual understanding in dealing with knowledge transfer behaviors [12,73]. Moreover, from the perspective of the learning curve, a consultant's ability in ERP implementation grows over time. If the consultants have rich experience in the implementation domain, they would be better able to transfer know-how and fine tune the system to match a given industry's particular processes [64,65,68]. In addition, Keiley [45] revealed that the knowledge recipients (members of the implementing firm) will judge whether the knowledge from the sender (consultants) is credible. Only when the knowledge from the sender is considered to be correct and useful will the recipient trust the sender and be willing to exchange their own knowledge. Thus the fifth hypothesis:

H5. The consultants' industry experience has a positive impact on the knowledge transfer climate.

The second factor relating to the consultant side is the extent of project management capabilities. Project management capabilities have also been shown to positively impact knowledge transfer in many large-scale and complex ERP projects [72,75,79,85]. Somers and Nelson [81] pointed out that properly regulating the scale of the project can avoid time and cost overruns. Prior research also found time-based bonds are vulnerable to schedule delays, and consultants need to control the project schedule to ensure such bonds remain strong [16,50,63,89]. Given more advanced project management skills, the participants will have more opportunities to establish an appropriate climate for knowledge transfer [41]. Based on these findings, this research sets the sixth hypothesis as follows:

H6. The consultants' project management capabilities have a positive impact on the establishment of the KTC.

Reward system is the third factor relating to the consultant side. External experts might have interests which work against those of the implementing firm's internal staff, which can raise a barrier to knowledge sharing [27,84,89]. Bock and Kim [9] pointed out that external incentives can trigger knowledge-sharing. Ko et al. [50] believed that rewards will affect knowledge transfer during ERP implementation. As an ERP implementation requires knowledge from both the implementing firm and consultants, rewards to the consulting firm could stimulate the consultants to transfer their knowledge to help the firm implementing the ERP system [4,9,86]. Thus the seventh hypothesis:

H7. The consultants' reward system has a positive impact on the establishment of the KTC.

Cultivating a positive knowledge transfer climate between participants is critical to the success of knowledge transfer. However, it is hard to cultivate, and failure to do so will result in a failure of knowledge transfer and, eventually, in the failure of the ERP implementation [3,71,89]. Based on these literature findings, the purpose of this study is to derive hypotheses to aid in the understanding of factors for relationship bonds that influence the development of a knowledge transfer climate and how a positive knowledge transfer climate can maximize the outcome of knowledge transfer for ERP implementation.

3. Research design

To test the proposed research model, data was collected by survey, and then processed by the partial least squares (PLS). The PLS analytical approach is generally recommended for predictive research models where the emphasis is on theory development, whereas LISREL is recommended for confirmatory analysis and requires a more stringent adherence to distributional assumptions [43]. Given that little prior theory work and very few empirical studies have been done exploring the impacts of knowledge transfer climate on supply chain performance, the focus of this study is on theory development. In terms of the second order factors and latent structural modeling in this study, compared to factor-based covariance fitting approach (e.g., LISREL, EQS, COSAN, and EZPATH), the component-based PLS avoids two serious problems: inadmissible solutions and factor indeterminacy [29,92]. PLS estimation can also be modeled in both reflective and formative constructs [17]. Finally, PLS is considered better suited for explaining complex relationships even where the sample size is small [29]. PLS software (smartPLS 2.0) was used for data analysis.

3.1. Operational definitions of variables, measurements and data collection

This paper adopted Singley and Anderson's [80] definition of knowledge transfer, and Bock et al.'s definition of knowledge transfer climate (KTC) [10]. As mentioned above, relationship bonding has been defined by Han [34]. Interdepartmental coordination (IDC) was defined by Kim et al. [48] as the degree of the conflict of interest among different functional units. Top management support (TMS) was defined as the extent to which top management provides necessary involvement, resources, and authority in guiding and assisting ERP implementation [89]. Internal incentives (II) were defined by Osterloh and Frey [70] as the means by which the degree of an individual's intrinsic motivation could be raised. Industry experience (IE) was defined as a consultant's insight into the implementing firm's industry and familiarity with the firm's experience [52]. Project

management capabilities (PMC) were defined as the ability to plan, organize, direct, and control resources to complete the implementation [79,81]. Reward systems (RS) were defined by Osterloh and Frey [70] as the performance rewards for consultants set according to milestones, client satisfaction, budgets, etc. Operational definitions of the variables are provided in Appendix A.

A confirmatory empirical study was conducted via a questionnaire survey. We identified the underlying domains for each construct and created corresponding items. We developed the items in the questionnaire either by adapting measures that had been validated by other researchers or by converting the definitions of constructs into a questionnaire format. All items were assessed through a seven-point Likert scale. The initial stage involved a literature search to determine the operational definitions and scale of the research variables. The questionnaire content was then drafted based on the original scale. The content, layout and glossary of the questionnaire were subsequently translated from the original English to Chinese through a series of discussions with ERP system experts. In addition to these revisions, the presentation of questions and phrases in the questionnaire were modified through discussions with several mid- and high-level managers with first hand knowledge of supply chain related activities. Finally, the questionnaire was pre-tested by a group of business students who had at least three years of managerial experience. The results of the pilot test were used to validate and refine the instrument and for the factorial validation of the questionnaire. The questionnaire items are presented in Appendix B.

To find appropriate research samples for the research framework, we adopted the manufacturing industry, which has frequently implemented ERP systems, as the primary object, while other industries (such as the retail industry) were treated as complementary.

Research objects were drawn from a random sample of managers and consultants involved in corporate ERP project implementation. The sample included firms and consulting companies that had already implemented an ERP system (regardless of outcome). The questionnaire was first delivered to 200 candidates by post, followed by e-mail, and finally by personal delivery by one of the authors. Respondents were required to fill out the questionnaire based on the company's current experience of ERP implementation. The completed questionnaires were subjected to statistical analyses for variables including reliability, validity, and the verification of their causality. In total, it took 9 months to collect 174 valid questionnaires, yielding an 87% valid response rate.

3.2. Analysis methods

The data analysis process has three parts: Description of Sample Characteristics, Quality Analysis of Scale Measurement, and Causality Test on Research Hypotheses. This research adopted descriptive statistical analysis methods. In terms of scale measurement, we used Cronbach's alpha analysis to evaluate internal consistency between different items within the same scale. We used exploratory factor analysis (EFA) to evaluate the quality of construct validity of a scale, which included convergent validity and discriminate validity. A confirmatory factor analysis (CFA) was conducted to test the hypothesized model. Our paper proposes a model containing both reflective and formative constructs and smartPLS 2.0, an adequate measurement model with an acceptable level of multicollinearity, was used to test the 1st and 2nd order variables.

4. Results and discussions

4.1. Data analysis

A wide variety of industries were represented in the responses, and Table 1 shows the respondents classified by industry type. Most of the implementing firms are of medium or large size. All investigated projects have at least a one year implementation history. As seen in Table 2, respondents represented both the implementing firm and consultant sides of ERP implementation projects. The descriptive statistics suggest that a wide variety of industries and roles were represented.

Table 1
Companies by industry.

Industry	Number of companies
Semiconductor	47
Mental/steel/machinery equipment	38
IC design	23
Electronics	21
Information and communication	21
Other services	7
Food/feed	4
Telecom	4
Other manufacturing	3
Chemical products	2
Plastics	2
Construction	2
Total	174

To scale measurement, all factors have Cronbach's alpha values above 0.7 and were thus considered acceptable. Output results of Bartlett's Test of Sphericity and the Kaiser–Meyer–Olkin (KMO) sampling adequacy test (using SPSS statistical software for Windows) were above 0.7, indicating a co-variation existing between each construct. Bartlett's Test of Sphericity derived a p-value close to 0. Since all the requirements were met, it was appropriate to conduct factor analysis. The principal component analysis method of factor analysis revealed that factor loadings were all above 0.7, indicating that every measurement item was matched with its corresponding latent variables [5]. To test the validity of all constructs used in this study, we performed an exploratory factor analysis (EFA) on the sample data using SPSS for Windows 13.0, resulting in 17 factor correlations above .60. The other models marginally fit the overall factor structure. Measures were loaded on their corresponding constructs as conceptually designed in this study. The results of factor correlations are shown in Table 3. Thus, it is reasonable to conclude that the designed items in the scale of this research are trustworthy [17].

The PLS structural model and hypotheses were assessed by examining path coefficients and their significance levels. The PLS method does not directly provide significance tests or confidence interval estimates of path coefficients in the research model. Therefore, a bootstrapping technique was used to estimate the significance of path coefficients. Bootstrap analysis was done with 500 re-samples and path coefficients were re-estimated using each of these samples. The vector of parameter estimates was used to compute parameter means, standard errors, significance of path coefficients, indicator loadings, and indicator weights.

To test the mediator, if (1) antecedent variables have a significant predictive power on mediators; (2) mediators have a significant predictive power on dependent variables; (3) antecedent variables lost their predictive power for the dependent variables when mediators are used simultaneously to predict the dependent variables in a model, then the mediator should have greater power to predict the dependent

Table 2
Respondents' role in ERP project.

Role of respondents	Number of companies
Implementation firm's project team member	93
Implementation firm's end user	40
Consultant in ERP package provider	21
Consultant from 3rd party	16
Other	4
Total	174

Table 3
The results of factor correlations.

	IDC	IE	II	KT	KTC	RS	PMC	TMS
IDC	1							
IE	0.5235	1						
II	0.6607	0.5027	1					
KT	0.5706	0.7363	0.5836	1				
KTC	0.6396	0.7175	0.6835	0.8537	1			
RS	0.5024	0.6491	0.6555	0.6849	0.6799	1		
PMC	0.5921	0.6945	0.6069	0.7971	0.7988	0.7337	1	
TMS	0.6657	0.402	0.6269	0.4762	0.5743	0.4012	0.4888	1

variables than by antecedent variables alone [11,46]. Fig. 2 shows the relationship bonding factors (antecedent variables) have a significant predictive power on KTC (the mediator), which proves the first condition ("*", "**", and "***" indicate that the *p*-value is below 0.05, 0.01, and 0.001 respectively, and this applies throughout this research). In condition 2, KTC is statistically significant to the KT. Fig. 2 also shows that TMS and II lost their predictive power for the KT when KTC was used simultaneously. The third condition, therefore, is also proved. Hence, according to Kenny et al. [46], KTC could be deemed a partial mediator and has greater power to predict the dependent variables (KT) than by antecedent variables alone.

The results of the three tests indicate that the TMS, II, IE, and PMC should impact on KT through the mediator (KTC). All of the correlations are positive, meaning that a high level of KT is caused by a high level of KTC, and a high level of KTC is formed with high levels of TMS, II, IE, and PMC. As shown in Fig. 2, 73.5 percent of the variance in KTC was explained by the factors of the knowledge sender (the consultant) and the receiver (the implementing firm). KTC explained 78.8% of the variance in knowledge transfer. Moreover, the results provided strong significance for hypotheses 1, 3, 4, 5, and 6. Furthermore, although there is no evidence that IDC and RS have any influence on the KTC or KT, as mentioned earlier, there are theoretical and empirical reasons for believing that a positive knowledge transfer climate can contribute to a better knowledge transfer outcome in ERP implementations. Table 4 displays the test results of the hypotheses.

4.2. Discussion of findings

As organizations approach the challenges of implementing an ERP system, they are faced with the critical problem of how to best deploy

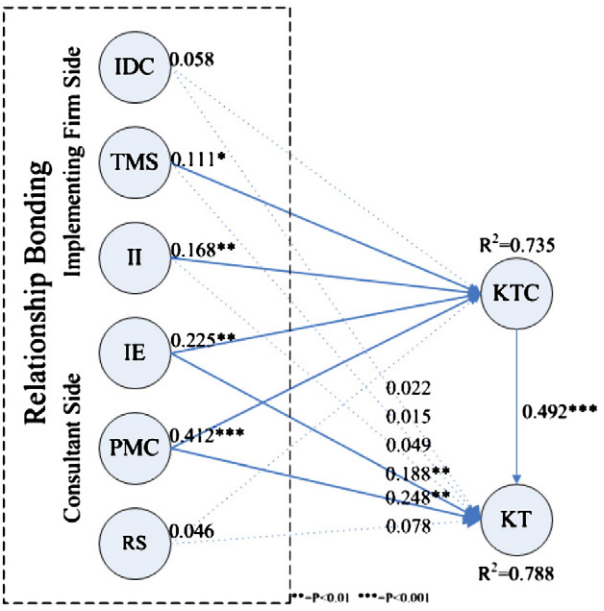

Fig. 2. Model results.

Table 4
The results of hypotheses testing.

Knowledge transfer climate		
H1	KTC has a positive impact on the effect of knowledge transfer.	Supported
Relationship bonding: implementing firm side		
H2	Interdepartmental coordination within the implementing firm has a positive impact on the knowledge transfer climate.	Not supported
H3	Top management support within the implementing firm has a positive impact on the knowledge transfer climate.	Supported
H4	The implementing firm's internal incentives have a positive impact on the knowledge transfer climate.	Supported
Relationship bonding: consultant side		
H5	The consultants' industry experience has a positive impact on the knowledge transfer climate.	Supported
H6	The consultants' project management capabilities have a positive impact on the establishment of the KTC.	Supported
H7	The consultants' reward system has a positive impact on the establishment of the KTC.	Not Supported

this huge, complicated system through managing knowledge transfer between participants. This study examined the impact of the knowledge transfer climate on knowledge transfer and its antecedents between the implementing firm and its consultants. The goal of this paper is to develop a model of the antecedents of a knowledge transfer climate that may be beneficial for knowledge transfer in ERP implementation. The following section presents a discussion of the findings.

While Newell et al. [68] considered the ERP implementing firm and the consultants to be a single project team, other studies explored how the interests of the parties differ. For example, an agent's behavior could create conflict between team members and may hinder their collaboration [1,39,48]. Hence, on the implementing firm side, our results suggest that top management support and internal incentives are helpful for cultivating a positive environment for effective knowledge transfer. This is important in ERP implementation because, for any organization, an implementation usually connotes a structural change with regard to present procedures, work flows and systems. Therefore, a top–down authorization to justify such an implementation project could reduce internal resistance. Incentives may also increase the motivation of project staff and employees to actively participate, thus raising the willingness to acquire new knowledge.

On the other hand, interdepartmental coordination in the implementing firm does not directly influence the formation of a positive knowledge transfer climate. It seems intuitive that coordination should assist knowledge transfer but, in this case, it may not be necessary true because, when taking a large and complex project, the team needs more authority to control the project scope. Our finding is consistent with findings found by Helo et al. [35] that greater interaction among departments in the implementing firm, the more difficulty of success implementation will be. This indicates that coordination at the same hierarchical level may not be sufficient to ensure harmony. Furthermore, Ko [49] revealed that the increased level of interaction, communication, and cooperation will create stress among the project implementation team members. Compared with other system implementation projects, ERP implementation is more complicated and requires more sophisticated decision making. The implementing firm therefore needs to ensure the support of top managers to solve complex conflicts between departments. Top management support appears to play a more important role than interdepartmental coordination for precipitating a decision and minimizing conflicts.

Our findings also show that the consultant's industry experience and project management capabilities are beneficial in building a strong knowledge transfer climate. When assisting in an ERP implementation, the consultants will not only need to control the project

schedule from time to time, but also need to tune the new system to fit the firm's unique business logic. Therefore, previous implementation experience relevant to the implementing firm's industry would be seen as a desirable trait in the consultant. The higher value the client places on consultant experience, the more willing the client will be to receive it. This positive feedback leads to the development of a healthy knowledge transfer climate.

Chen et al. [16] described a case study, the results of which suggest that a team with scanty project management skill will tend to distort the project scope to match each key member's needs, thus exaggerating the project scope and reducing the likelihood of a successful ERP implementation. An experienced external consulting and support team can help the project team to define the project scope more accurately and properly deal with different user requests [41]. In addition, the current study found that consultant project management capabilities help create an atmosphere conducive to effective knowledge transfer, leading to agreement on project goals and successful ERP implementation.

Although a consultant's industry experience and project management capabilities have been found to have a positive influence on the formation of a positive knowledge transfer climate, consultant rewards did not have a similar impact. In practice, consultant rewards are based on the passage of milestones. Thus, consultants may be motivated to pay more attention to passing milestones than to cultivating a climate conducive to knowledge transfer.

In summary, the results of this paper support Hypotheses 1, and 3–6. The findings indicate that relationship bonding contributes to a positive knowledge transfer climate, which is helpful for knowledge transfer in ERP implementation.

5. Implications to theory and practice

The goal of this paper is to explore the environmental and organizational contexts of knowledge transfer climates. Our findings have the following implications:

5.1. A model of knowledge transfer in ERP implementation

While prior studies on ERP implementation have largely focused on the importance of best practice [12,21,26,38,62,90], this paper's discussion of the knowledge transfer climate and relationship bonding focuses on factors that influence the results of knowledge transfer during ERP implementation. These factors are divided into three types: relationship bonding factors related to the implementing firm, those related to the consultants, and those related to the impact of the knowledge transfer climate. Surveys and corresponding multivariate analysis have verified the significance of the bonding factors (top management support, internal incentives, industry experience, and project management capabilities), the role that the knowledge transfer climate plays during the knowledge transfer process, and the impact on the transfer process.

From an academic viewpoint, this model provides two major contributions. Firstly, this paper's findings matched those which indicate that knowledge transfer will not be realized without a positive climate for knowledge transfer [2,10,69]. ERP implementation is expensive and irreversible. Thus it is important for firms to be as successful as possible in their implementation efforts [60,64,89]. Our framework was developed from the knowledge management perspective and can be used to provide beneficial knowledge to help improve the likelihood of a successful ERP implementation.

Secondly, Ko et al.'s [50] study of ERP implementation focused on knowledge transfer at the level of the individual. However, several studies of knowledge management have suggested that knowledge transfer in organizations should be approached at the organizational level, because problems in the organizational context are one of the most important factors impeding knowledge transfer [2,80,84]. This research adopted an organizational viewpoint to investigate how knowledge transfer takes place across different organizations and what factors influence the quality of inter-organizational knowledge transfer.

For practitioners, this paper demonstrates that the creation of a knowledge transfer climate is a prerequisite to a successful ERP implementation. That is to say, a firm can only gain benefits from the new system when it has absorbed the knowledge necessary to fully operate that system. Firms contemplating ERP implementation will find the factors and empirical findings provided by our model useful to explain the influence of knowledge transfer made between the firm and the consultant during ERP implementation.

5.2. The role of the knowledge transfer climate

This paper also contributes to the understanding of the role played by the knowledge transfer climate. In an academic sense, the theoretical rationale for this study draws upon knowledge transfer theories. As already discussed, knowledge is distributed in an organizational context and the project implementation team needs to access that knowledge to obtain a holistic understanding of the situation. Therefore, it's critical to form a positive knowledge transfer climate to encourage employees and consultants to share their knowledge. This paper not only offers insight into how knowledge can be transferred successfully from the implementing firm and the consultants, but also provides strong evidence of the importance of building a robust knowledge transfer climate during the ERP implementation process.

From the practical standpoint, the model of the knowledge transfer climate can be used to assist an implementing firm and its consultants in understanding important internal and external factors. For example, an implementing firm can adopt the suggestions of this research to identify proper actions which will help members continually bond, thus easing the transfer and acquisition of knowledge.

5.3. The role of relationship bonding

Although all participants need to achieve a common goal, this study suggests that the ERP project team should be recognized as being made up of different parties with their own interests that may hinder collaboration. In the support of relationship bonding, the findings of this paper fill a gap of how to generate a positive knowledge transfer climate between parties of different backgrounds. Our theoretical discussion and empirical examination of the sender–receiver framework and bonding theory also indicate that the focus on a tight relationship between participants may be more appropriate. Therefore, ERP implementation also needs to consider the creation of solid relationship bonds.

This study confirms the implications found in the literature that relationship bonding has a strong influence on the formation of a positive climate for knowledge transfer. The findings of this paper show that the level of bonding (i.e. top management support and internal incentives on the implementing firm side; industry experience and project management capability on the consultant side) will determine the best bonding solution for participants in ERP implementation.

In practice, ERP implementation has usually been treated as a project under time pressure. The tension participants associated with the implementation process can affect their behavior. For example, one may avoid being named to a team or decline to share his/her opinions with others. However, knowledge transfer requires an active and positive interaction between participants. Therefore, we examined bonding factors for their contribution to generating a positive knowledge transfer climate, and found these factors to be particularly critical in ERP implementation. For example, bonuses could be used as internal rewards to encourage firm members to invest in the project. The employment of a consulting firm which is knowledgeable and experienced in the implementing ERP solutions within the firm's industry is also conducive to knowledge transfer.

6. Conclusion and future research

Organizations implementing an ERP system must consider how to best deploy this huge and complicated system through the management of knowledge transfer among participants. This study seeks to address the issue of knowledge transfer by examining the formation of the knowledge transfer climate and relationship bonds. This paper describes the complex challenges facing implementation team members as they restructure their processes to match the new system. The study presents two major findings: (1) Relationship bonding and the knowledge transfer climate are important parts of improving knowledge transfer in ERP implementation; and (2) relationship bonding between team members needs to be deliberately cultivated, so as to develop a climate that promotes knowledge transfer. We find that, by isolating the important factors that encourage the knowledge transfer in ERP implementation, knowledge transfer will be complex but need not be chaotic [23]. Future research may suggest ways to promote knowledge transfer with greater confidence and precision, and help companies further improve the likelihood of a successful ERP implementation.

This study has two limitations that provide opportunities for future research. First, our study focused specifically on how knowledge transfer between the firm and the consultant contributes to a better outcome of ERP implementation, and paid limited attention to many other managerial areas and variables, e.g., system or technology-related factors that can influence the magnitude of implementation. Future research can capture more variables from other domains to further enhance our understanding of ERP implementation.

Secondly, the factors of bonding were limited to those related to ERP implementation. Since the bonding factors may differ between industries, the implications of causal relationships between the constructs in the model must be made with caution. We suggest that other researchers could test this model based on empirical data from different industries and countries.

For future research, our model is based on the literature of knowledge management [69,89] and relationship bonding [34,68] theory. Through empirical testing and analysis, we provide a solid base for understanding the importance of the role of relationship bonding and the knowledge transfer climate in ERP implementation. Future research could extend this model and consider more factors that may influence knowledge transfer during the ERP implementation stage.

Appendix A. Supplementary data

Supplementary data to this article can be found online at doi:10.1016/j.dss.2011.09.007.

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