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Understanding the determinants of EKR usage from social, technological and personal perspectives

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Abstract.

With the capacity to provide the necessary infrastructure to implement knowledge management processes, electronic knowledge repositories (EKRs) have gradually evolved into a backbone for many organizations, and have become a topic of much concern in recent MIS studies. Among the diverse theories commonly employed to target the issue are social capital theory, social cognitive theory, and task technology fit (TTF). Social capital theory primarily addresses issues of what components constitute a social network and how they influence an individual's behavior, necessitating the introduction of social cognitive theory as the foundation for the interpretation of personal cognition. Task technology fit theory, which highlights the fit between the technological characteristics and the user's task character, is also a key factor in determining the EKR usage. This paper integrates these three theories to investigate and compare the main influences on EKR usage from personal, social and technological perspectives. Through a sampling survey of 194 EKR users, EKR self-efficacy, trust, and task technology fit are found to have substantial influences on the EKR usage. Among these three main factors, EKR self-efficacy plays the most important role in determining EKR usage.

Keywords: social capital theory; social cognitive theory; task technology fit; electronic knowledge repositories

1. Introduction

Electronic knowledge repositories (EKRs), by definition, are electronic stores of content acquired about all subjects for which the organization has decided to maintain knowledge, and comprise multiple knowledge bases as well as the mechanisms for acquisition, control, and publication of the knowledge [1]. It is hard to make a distinction between knowledge contributors and seekers in that the same individual can be a contributor and a seeker at different points in time. The process of

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successful knowledge sharing through EKRs involves people contributing knowledge to populate EKRs (e.g., customer and supplier knowledge, industry best practices, and product expertise) and people seeking knowledge from EKRs for reuse [1, 2]. Accordingly, this study does not distinguish between knowledge contributors and seekers in EKR usage and EKR usage is thus defined in terms of 'frequency' of searching and contributing knowledge [1–4].

Whether an organization can successfully implement EKRs is highly contingent on the employee-users' willingness and competence to build a solid infrastructure for KM. Past research concerning EKR usage indicates that, in comparison with some other information systems, knowledge management processes are more intricate and more prone to individual differences. The theoretical tools used to investigate individuals' reactions to EKRs have included social exchange theory (SET) [5], social capital theory [1], theory of planned behavior (TPB) [2], trust theory [6], task technology fit (TTF) [2], and social cognitive theory [6]. The various research theories suggest that the issue of EKR usage can be considered from many different perspectives. This study tries to integrate social cognitive theory, social capital theory and TTF to probe EKR usage behavior, aiming to provide a more comprehensive view that simultaneously includes individual, social, and technical perspectives.

The motives behind tackling the issue from these three perspectives are three-fold. Firstly, the social technique approach highlights the importance of simultaneously considering the social and technical dimensions in any system development. Research on KMS usage behavior also reveals the similar weight of these two dimensions [7]. Past studies, however, often address only one dimension, and results based on such studies would inherit their bias and limitations.

Secondly, while some researchers have integrated two or more theories in their studies (Table 1), most such integration centers on integration within one dimension, such as integrating SET and social capital theory, or integrating social cognitive theory and trust theory, which are basically focussed on the social dimension. Some other researchers went further, integrating the individual and technical dimensions by coupling TPB and TTF. This study attempts to take into consideration the individual, social, and technical dimensions, and to integrate theories in all three fields to gain a better understanding of EKR usage.

Thirdly, among previous studies addressing a specific perspective, researchers have demonstrated variables within each perspective which significantly influence EKR usage. However, juxtaposing and comparing the three dimensions so as to find out which of these has the greatest impact may prove even more useful and beneficial, both at the managerial level and to individual users.

Social capital theory, social cognitive theory, and TTF are enlisted and integrated in our study for their relevance and fitness in explaining users' behavior. The core concepts and important variables of each theory and their suitability for EKR study will now be discussed.

Social capital theory, broadly referring to all connections among individuals, mainly deals with three dimensions (structural, cognitive, and relational), which shape the quality and quantity of an organization's social interactions [8]. Social capital is not just the sum of the institutions which underpin a society, but the glue that holds them together [9]. As validated by recent studies, social capital is a useful theory when examining social relationships in EKR usage, because these three dimensions emphasize the resources embedded within networks of human relationships, providing the conditions necessary for knowledge sharing to occur [1, 5]. Tsai and Ghoshal [10] identified three key aspects which define the context for knowledge exchange in the three dimensions: trust, shared vision, and social interaction tie. These three key aspects are adopted in this study, as they are organizational resources and assets rooted within social relationships that can significantly improve the efficiency of coordinated action.

Goodhue and Thompson [11] indicated that technology utilization is governed by the match between technology features and the requirements of the task. Rational, experienced users will choose those tools and methods that enable them to complete the task with the greatest net benefit. Therefore, the use of a technology may result in different outcomes depending upon its configuration and the task for which it is used [11]. Some researchers have applied TTF to explain employees' EKR usage [2].

Social cognitive theory, a widely accepted, empirically validated model of individual behavior, has often been applied to explain an individual's knowledge sharing behavior [3, 6]. Social cognitive theory argues that a person's behavior is shaped and controlled by the influences of the social network as well as the person's cognitions. Using EKRs for some people is not merely a matter of

Table 1
Literature review on EKR/KMS enablers

Authors (year)	Methodology	Study content	Theoretical background/enablers
Wasko and Faraj (2005) [5]	Survey (N = 604) and content analysis	Electronic networks of practice for knowledge contribution	**Social capital theory** Cognitive capital (*self-rated expertise, tenure in the field*) Structural capital (*centrality*) Relational capital (*commitment, reciprocity*) **Social exchange theory** individual motivations (*reputation, enjoy helping*)
Kankanhalli et al. (2005) [1]	Survey (N = 150)	Electronic knowledge repository (EKR) usage for knowledge contribution	**Social capital theory** Generalized trust, pro-sharing norms, identification **Social exchange theory** Costs (*loss of knowledge power, codification effort*) Extrinsic benefits (*image, reciprocity, organizational reward*) Intrinsic benefits (*knowledge self-efficacy, enjoyment in helping others*)
Bock et al. (2006) [14]	*Survey* (N = 134)	EKR usage for knowledge seeking	**Social capital theory** Collaborative norms **Social exchange theory** Costs (*perceived ease of use, future obligation*) Extrinsic benefits (*perceived usefulness*) Intrinsic benefits (*seeker knowledge growth*) **Decomposed theory of planned behaviour** Perceived behavioral controls (*self-efficacy, resource-facilitating conditions*)
Kankanhalli et al. (2005) [2]	Survey (N = 160)	EKR usage for knowledge seeking	**Task technology fit** Task interdependence, task tacitness **Technology acceptance model** Perceived ease of use **Theory of planned behavior** Incentive availability, resource availability, perceived output quality, KS norms
Hsu et al. (2007) [6]	Survey (N = 274)	Knowledge sharing in virtual communities for knowledge seeking and contributing	**Social cognitive theory** Knowledge sharing self-efficacy, personal outcome expectations, community-related outcome expectations **Trust theory** Economy-based trust, information-based trust, identification-based trust
Wu and Wang (2006) [15]	Survey (N = 204)	Organizational EKR use for knowledge seeking and contributing	**IS success model** System quality, knowledge/information quality, perceived EKR benefits, user satisfaction
King and Marks, (2008) [4]	Survey (N = 169)	KMS for knowledge contribution	**Social exchange theory** Organization support **Agency theory** Supervisory control
This study	Survey (N = 194)	Organizational EKR usage for knowledge seeking and contributing	**Social capital theory** Social interaction tie, trust and shared vision **Social cognitive theory** EKR self-efficacy **Task technology fit** EKR characteristics, task technology fit

practical considerations, such as seeking information or knowledge, or solving problems. Personal feelings (such as efficacy expectations) may play a crucial role for people in using EKRs [1, 6]. For example, through contribution, a knowledge contributor's knowledge self-efficacy and confidence is boosted, as he knows that he can provide valuable knowledge that is useful to the organization [12]. Among the various factors in social cognition, self-efficacy has long been cited and validated as having a positive relationship with knowledge sharing behavior and with EKR usage [1, 6]. Based on this, our study adopts self-efficacy as an important factor in personal cognitions.

Although many researchers noted the importance of individual, technical, and social dimensions in explaining EKR usage, only rarely have studies attempted to integrate all three of the theories discussed above. While social capital theory gives prominence to explanations of the interpersonal relationships, the individual person's feelings and perceptions are less adequately considered. On the other hand, social cognitive theory is limited in that it is silent on the components within a social network and how they influence an individual's behavior [3]. Finally, neither of these theories addresses the technology characteristics or the fit between the user and the technology. Using the integration of personal, technological, and social perspectives, KS behavior in the organization should be better explained [13]. Therefore, our goal for this study is to form a theoretical model by adopting and integrating the three theories for the purpose of providing a comprehensive picture of EKR usage for knowledge seeking and contributing from the environmental, IT, and user perspectives, and also to help understand and compare the strength of each perspective's relationship with EKR usage.

2. Theoretical background and hypotheses

2.1. EKR usage

Fundamental to organizational knowledge capture and dissemination, EKR, as used in this study, refers to knowledge repositories that emphasize codification and storage of knowledge so as to facilitate knowledge reuse through access to the codified expertise [1, 2]. EKRs include various types of repositories such as expert knowledge repositories, lessons learned databases, project websites, and shared whiteboards [14]. People are free to come and go, but the value of their experience will be incorporated in the EKR systems which will in turn help themselves and later users to conduct their business, so it is important to understand the pre-determinants of EKR usage.

Although the technology acceptance model (TAM) may sound like a proper theoretical model for the investigation of EKR usage, it fails to account directly for the factors of social cost and benefit experienced by knowledge contributors, which may affect their EKR usage [2, 15]. Therefore, many theories have sprung into being to fill the gap by explaining the missing factors; the researchers were aware that approaches other than TAM should be considered (as summarized in Table 1).

Previous studies have pointed out the importance of contextual social factors in EKR usage and one of the many theories used to address the issue of contextual social factors is social capital theory [1, 5]. Kankanhalli et al. [1] identified generalized trust, pro-sharing norms, and identification as types of social capital and used them as moderating factors for EKR usage. The cost and benefit factors relating to an individual user's perspectives, however, are not considered by social capital theory. Wasko and Faraj incorporated social exchange theory as a supplement to social capital theory in their study [5], in order to better explain knowledge contribution behavior. Other researchers emphasized the importance of personal cognitive factors in forming knowledge sharing behavior. Hsu et al. [6] used social cognitive theory as the foundation of personal dimensions for explaining KS behavior in virtual communities. Considering the complexity of the virtual world, they coupled trust theory with social cognitive theory to add social dimensions to their research. With the internet, intranets, and the web, knowledge seeking and contributing have gradually become a matter of several clicks and people are thus brought together 'virtually'; EKR usage within an organization is in some ways similar to a virtual community [3, 6]. Finally, technological enablers and characteristics should not be neglected, since effective EKR usage may be seriously hindered if information technology fails to match the organizational tasks to be supported [4, 15]. Kankanhalli et al. [2] showed that research on EKR usage has often been limited to

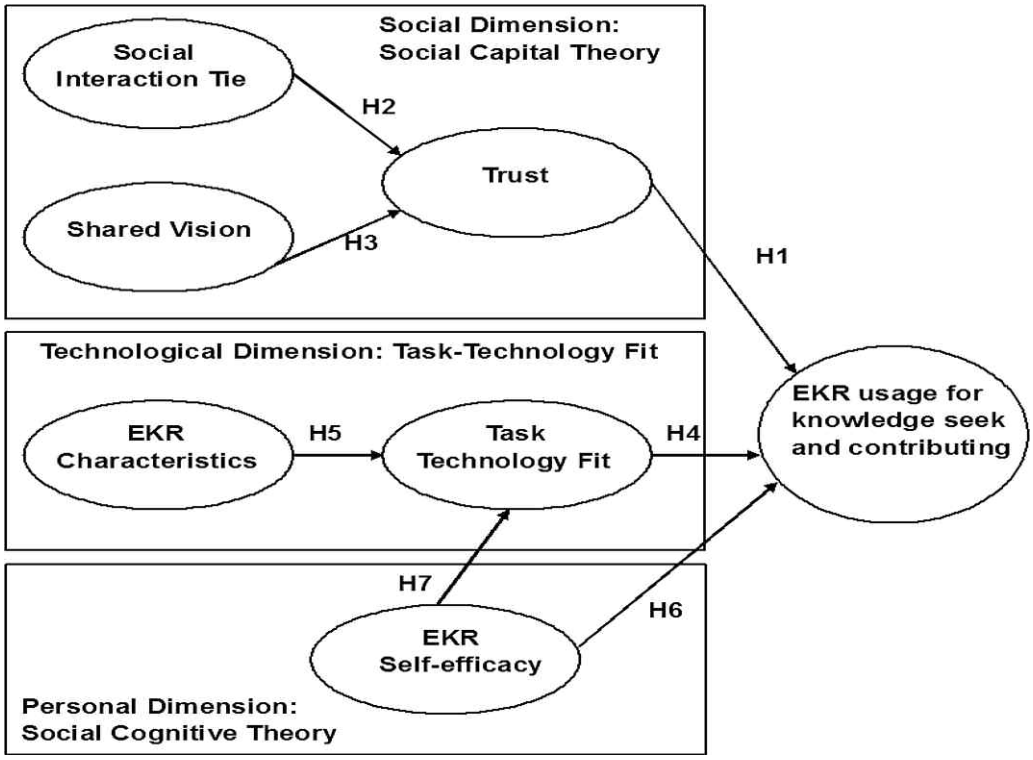

Fig. 1. An integrated EKR usage model.

focus on the costs and benefits within a single organization setting, and proposed the integration of TTF with TPB to form a socio-technical model for EKR seeking. TTF holds that knowledge seekers are accomplishing their tasks through seeking knowledge from EKR. In addition, Wu and Wang's study [15] showed that system quality and functionalities have influences on knowledge contribution behavior. We thus infer that, if the quality and functionalities provided in EKRs are poor, contribution behavior would be greatly hindered. Drawing from these theories for EKR usage, this study proposes that the integration of social cognitive theory for personal cognitions, social capital theory for social relationships, and TTF for technical enablers may provide theoretical support for a better understanding of how these three perspectives interact in EKR usage. The integrated EKR usage model is summarized in Figure 1. We will now derive the proposed hypothesis in detail.

2.2. Social capital theory in EKR usage

Fundamental among trust, shared vision and social interaction ties, the concept of trust has been identified as the most important determinant for people to share knowledge through EKRs [1, 6]. Trust is defined as the belief in the good intent, competence, and reliability of employees with respect to contributing and reusing knowledge through EKRs [1]. With mutual trust, individuals are more willing to increase communication and to share experience with other team members through use of EKRs [6]. Tsai and Ghoshal [10] provided empirical evidence for their finding that resource exchange and combination will be influenced by trust and trustworthiness. Based on this, our first hypothesis is:

Hypothesis 1 Trust is positively related to EKR usage.

Since trust is built on a series of satisfactory interactions, studies have indicated that both social interaction ties (SIT) and shared vision (SV) have a positive impact on trust [10]. According to Chiu,

Hsu, and Wang [3], SIT refers to the strength of the relationships, the amount of time spent, and communication frequency among people in the organizations. As the interaction between people grows over time, mutual trust becomes mature [16]. SV, on the other hand, refers to an individual's perceptions of whether members share the same vision, goal, and value about knowledge sharing [10]. SV describes the harmony of interests among members, which in turn fosters and bolsters more trusting relationships [17]. Therefore, we propose that:

Hypothesis 2 Social interaction ties are positively related to trust.

Hypothesis 3 Shared vision is positively related to trust.

2.3. Task technology fit in EKR usage

TTF refers to the congruence among the perceived capabilities of technology, task requirements, and the competence of users with the task and the systems [18]. Goodhue and Thompson [11] developed the 'technology-to-performance chain' model, in which technology utilization depends on the fit between the technology and the tasks it supports. Similarly, in work based on the IS success model, Wu and Wang [15] found that user satisfaction positively affects EKR usage. In order to perceive EKR to be satisfying, one must feel that there is a good fit between the task and the EKR systems. Therefore, TTF is predicted to be a significant precursor to EKR usage:

Hypothesis 4 Task technology fit is positively related to EKR usage.

To better understand TTF, this study further investigates EKR characteristics. With reference to Gold et al. [19], this study defines EKR characteristics as the technological dimensions that include business intelligence, collaboration, distributed learning, knowledge discovery, knowledge mapping, and opportunity generation in carrying out employees' tasks. The technology that comprises EKRs, possessing the capability to change the relationships between members in an organization, make it different from more traditional information systems [20], and, therefore, all the functionalities should be included for EKRs. In Quaddus and Xu's case study conducted in 2005 [21], six companies support the relationship between EKR characteristics and perceived usefulness. Similarly, Wu and Wang [15] indicated that EKR quality has impact on the user's satisfaction. Therefore, we propose that the feeling of fit between task and EKR is influenced by its characteristics.

Hypothesis 5 EKR characteristics are positively related to task technology fit.

2.4. Social cognitive theory in EKR usage

Self-efficacy, the core concept of social cognitive theory, reflects an individual's momentary belief in his or her capability to perform a specific task at a specific level of performance [22]. It is concerned not with the skills one has, but with judgments of what one can do with whatever skills one possesses [23]. Accordingly, this study defines EKR self-efficacy as the belief of having the ability in using EKRs to execute courses of action required to attain designated types of performance [24].

Cabrera and Cabrera [25] concluded that perceived self-efficacy would promote the sharing of knowledge. In addition, several more recent studies have indicated the significant relationship between self-efficacy and usage of information systems such as decision support systems and EKRs [1, 24, 26]. This means that when people have confidence in using EKRs to accomplish the assigned tasks, they will be more willing to use them, resulting in an increase in EKR usage. Therefore, we propose that:

Hypothesis 6: EKR self-efficacy is positively related to EKR usage.

Marcolin et al. [18] claimed that self-efficacy is a more effective and appropriate gage than technology characteristics or task complexity level in evaluating the degree of TTF in the context of perception or subjective measurement. If EKR users are not confident in using the technology in hand to achieve

their tasks, they will not consider the use of it to be appropriate to the tasks. Several recent studies have been conducted to support this argument that there is a positive relationship between self-efficacy and task technology fit [24, 27]. Therefore,

Hypothesis 7 EKR self-efficacy is positively related to perceived task technology fit.

3. Research methodology

3.1. Sampling procedure

In order to establish generalizability, allow replicability, and gain statistical credibility, the survey method was used to test the research model. The unit of analysis for the research model was individual employees from all kinds of organizations. The sample includes 500 people who were randomly selected from a list of 2000 part-time MBA alumni, and whose work locations, including a range of international and local companies, were scattered through all parts of Taiwan. All the subjects received an e-mail inviting them to participate in our research. In the e-mail, we gave them a hyperlink to our online survey web pages, which were available from May 11 to June 8, 2006. We programmed the web pages to request that all participants answer each measurement item. Therefore, no missing values were found in the final results. On the cover page, we gave the participants the definition of EKRs and some statements guaranteeing their privacy in filling out the questionnaire. Furthermore, our research gave every participant a small gift at the close of our survey to increase the response rate. Overall, of the 500 participants, 194 usable data sets were received for analysis, giving a response rate of 38.8 percent. Nonparticipation was mainly due to the facts that the e-mail addresses we sent might be invalid, KM programs for the participants were still in discussion stage when the survey was sent, or a lack of time for them to complete the survey.

Demographic information was also collected from each respondent (as summarized in Table 2). Most of the participants work in IT-related industries (22%), manufacturing (21%) and the service sector (16%). All these industries heavily rely on EKRs to get organizational knowledge that helps improve their job performance, such as understanding a customer's profile quickly, avoiding repetition of errors, and discussing situations online as a virtual team to solve their problems. Furthermore, the work positions of our participants showed a well-mixed distribution, and participants with over four years' experience with EKRs account for 85 percent of responses, which indicates that most of them are quite familiar with EKRs. In sum, the demographic data points out that all of the participants are suitable representatives for the goal of our research.

Time-trend extrapolation analysis was performed to test non-response bias. Independent *t*-tests did not show any statistically significant differences between early and late respondents in terms of gender, age and work experience, or EKR usage. In addition, Harman's single-factor test was used to examine common method bias. The results revealed seven factors with an eigenvalue greater than one, and no single factor explained most of the variance (the variances explained ranged from 5.94 to 17.04%), indicating the absence of a significant variance common to the measures. Therefore, non-response biases and common method bias are minimized.

3.2. Operationalization of constructs

Where available, constructs were measured using tested questions from prior studies or such questions were slightly modified to enhance content validity of the scales used [28]. All questions in the instrument were measured using seven-point scales from 'strongly disagree' (1) to 'strongly agree' (7). Table 3 summarizes the questions measuring each construct in this study.

Backward translation (with the material translated from English into Chinese and back into English, versions then compared, and any discrepancies resolved) was used to ensure consistency between the Chinese and the original English version of the instrument. A pilot study was conducted involving five industry experts, six PhD students, and 10 master's degree students. Comments and suggestions on the item contents and structure of the instrument were also solicited.

Table 2
Demographic characteristics of the sample

Demographic variable	Sample composition (N = 194)	
Gender	Male	125 (64.4%)
	Female	69 (35.6%)
Education	Bachelor's degree	87 (44.8%)
	Master's degree	95 (49.0%)
	PhD	12 (6.2%)
Age	21–30 years	9 (4.6%)
	31–40 years	105 (54.1%)
	41–50 years	61 (32.5%)
	51 years or above	17 (8.8%)
Experience with EKRs	1 year or below	9 (4.6%)
	2–3 years	19 (9.8%)
	4–6 years	58 (29.9%)
	6–9 years	72 (37.1%)
	10 years or greater	36 (18.6%)
Work position	Senior manager	27 (13.9%)
	Middle manager	44 (22.7%)
	Supervisor	45 (23.2%)
	Clerical	35 (18.0%)
	Technical	43 (22.2%)
Industry	Manufacturing	41 (21.1%)
	Service	30 (15.5%)
	Hospital	12 (6.2%)
	Government	18 (9.3%)
	Information technology	43 (22.2%)
	Finance	11 (5.7%)
	Education	27 (13.9%)
	Others	12 (6.1%)
Size of business	1–50 employees	45 (23.2%)
	51–100 employees	21 (10.8%)
	101–500 employees	43 (22.2%)
	501–1000 employees	35 (18.0%)
	1001 or more employees	50 (25.8%)

4. Data analysis and results

4.1. Assessment of the measurement model

Data analysis is carried out using a two stage methodology – the measurement model and the structure model [29]. The first step in the data analysis is to assess the construct validity for the seven measurement elements using PLS confirmatory factor analysis. The internal consistency of each dimension was assessed by computing Cronbach's alpha. As shown in Table 3, the lowest value of Cronbach's alpha is 0.90 for integrity-based trust, with all of the values easily exceeding Nunnally's criterion of 0.70 [30].

Convergent validity was assessed with three tests: loadings of each measurement items, composite reliability (CR), and average variance extracted (AVE). Loadings for the items of the constructs are expected to be 0.70 or above to achieve convergent validity [31]. In our study, as summarized in Table 3, all of the items except EKRC2 have loadings over 0.70 for their respective constructs. EKRC2's loading is 0.62, which is still acceptable. The value of CR should exceed 0.8 and the value of AVE should be greater than or equal to 0.5 for satisfactory convergent validity for a construct [32]. As summarized in Table 4, the CRs for the constructs with multiple items range from 0.93 to 0.97 and the AVEs range from 0.63 to 0.90. All are well above the cutoff, showing acceptable convergent validity.

Table 3
Summary of measurement scales

Construct	Measure	Mean	Standard deviation	Loading
EKR self-efficacy [24]		Cronbach's alpha = 0.94	(Mean = 5.16, SD = 0.89)	
In achieving the assigned task(s), I feel that ...				
EKRSE1	The level of my capability in using EKRs to successfully finish the job is very high.	5.10	0.94	0.87
EKRSE2	The level of my understanding about what to do in using EKRs is very high.	5.19	0.92	0.89
EKRSE3	The level of my confidence in using EKRs is very high.	5.19	0.93	0.93
EKRSE4	The level of my comfort in using EKRs is very high.	5.09	0.97	0.87
EKRSE5	In general, the level of my skill in using EKRs for accomplishing the task is very high.	5.24	0.95	0.90
Social interaction ties [3]		Cronbach's alpha = 0.90	(Mean = 5.23, SD = 0.90)	
SIT1	I maintain close social relationships with some people in my organization.	5.39	0.92	0.89
SIT2	I spend a lot of time interacting with some people in my organization.	5.01	1.00	0.86
SIT3	I know some people in my organization on a personal level.	5.18	0.96	0.87
SIT4	I have frequent communication with some people in my organization.	5.32	0.91	0.90
SIT1	I maintain close social relationships with some people in my organization.	5.39	0.92	0.89
Trust [1]		Cronbach's alpha = 0.90	(Mean = 5.10, SD = 1.16)	
TRU1	I believe that people in my organization give credit for other's knowledge where it is due.	5.43	0.97	0.87
TRU2	I believe that people in my organization do not use unauthorized knowledge.	4.85	1.18	0.84
TRU3	I believe that people in my organization use other's knowledge appropriately.	5.12	1.02	0.91
TRU4	I believe that people in my organization share the best knowledge that they have.	4.99	1.12	0.88
TRU1	I believe that people in my organization give credit for other's knowledge where it is due.	5.43	0.97	0.87
Shared vision [3]		Cronbach's alpha = 0.94	(Mean = 5.18, SD = 1.29)	
SV1	People in my organization share the vision of helping others solve their professional problems.	5.12	1.15	0.95
SV2	People in my organization share the same goal of learning from each other.	5.16	1.15	0.96
SV3	People in my organization share the same value that helping others is pleasant.	5.27	1.10	0.93
Task-technology fit [24]		Cronbach's alpha = 0.97	(Mean = 4.97, SD = 1.41)	
In helping me to perform the assigned task(s), ...				
TTF1	The functionalities of EKRs were very adequate.	5.14	1.18	0.94
TTF2	The functionalities of EKRs were very appropriate.	5.05	1.19	0.93
TTF3	The functionalities of EKRs were very useful.	5.14	1.16	0.93
TTF4	The functionalities of EKRs were very compatible with the task.	4.97	1.15	0.94
TTF5	The functionalities of EKRs were very helpful.	5.11	1.16	0.93
TTF6	The functionalities of EKRs were very sufficient.	4.58	1.25	0.84
TTF7	The functionalities of EKRs made the task very easy.	4.90	1.20	0.89
TTF8	In general, the functionalities of EKRs were best fit the task.	4.85	1.22	0.86
EKR characteristic [19]		Cronbach's alpha = 0.92	(Mean = 4.79, SD = 1.88)	

(Continued)

Table 3
(Continued)

Construct	Measure	Mean	Standard deviation	Loading
My organization uses EKRs that allow…				
EKRC1	Employees to collaborate with other persons inside the organization.	5.16	1.17	0.78
EKRC2	Employees to collaborate with other persons outside the organization.	4.23	1.41	0.62
EKRC3	Employees in multiple locations to learn as a group from a single source or at a single point in time.	4.78	1.49	0.78
EKRC4	Employees in multiple locations to learn as a group from a multiple source or at multiple points in time.	4.96	1.49	0.81
EKRC5	Employees to search for new knowledge.	5.09	1.26	0.83
EKRC6	Employees to map the location (i.e., an individual, specific system, or database) of specific types of knowledge.	4.91	1.29	0.83
EKRC7	Employees to retrieve and use knowledge about its products and processes.	5.03	1.31	0.85
EKRC8	Employees to retrieve and use knowledge about its markets and competition.	4.51	1.44	0.82
EKRC9	Employees to generate new opportunities in conjunction with its partners.	4.42	1.43	0.80
EKR usage [1,2]		Cronbach's alpha = 0.94	(Mean = 4.91, SD = 1.15)	
USA1	I frequently use EKRs to search knowledge in my work.	5.16	1.00	0.86
USA2	I frequently use EKRs to contribute knowledge in my work.	4.89	1.04	0.90
USA3	I regularly use EKRs to search knowledge in my work.	4.93	1.09	0.93
USA4	I regularly use EKRs to contribute knowledge in my work.	4.72	1.07	0.92
USA5	In general, the frequency of EKR usage for me is quite high.	4.85	1.15	0.90

Table 4
Discriminant validity and correlations

			Construct						
Construct	AVE	CR	TRU	SIT	SV	TTF	EKRC	EKRSE	USA
TRU	0.77	0.93	**0.88**						
SIT	0.78	0.93	0.57	**0.88**					
SV	0.90	0.96	0.53	0.65	**0.95**				
TTF	0.83	0.97	0.58	0.42	0.41	**0.91**			
EKRC	0.63	0.94	0.43	0.36	0.47	0.52	**0.79**		
EKRSE	0.80	0.95	0.58	0.49	0.39	0.53	0.38	**0.89**	
USA	0.81	0.96	0.57	0.49	0.39	0.60	0.43	0.62	**0.90**

CR = composite reliability; AVE = average variance extracted; TRU = trust; SIT = social interaction ties; SV = shared vision; TTF = task technology fit; EKRC = EKR characteristic; EKRSE = EKR self-efficacy; USA = EKR usage.
Diagonal elements are the square root of the AVE. These values should exceed the inter-construct correlations for adequate discriminant validity.

For satisfactory discriminant validity, the AVE for a construct should be greater than the squared correlations of that construct with the other constructs in the model [31]. Table 4 shows the correlations among the constructs. In this table, the diagonal elements represent the square root of the variance between the constructs and their measures. The off-diagonal elements are the correlations between the constructs. All diagonal elements are greater than their corresponding off-diagonal elements, suggesting that the respective constructs exhibit acceptable discriminant validity. Furthermore, all of the items load more highly on their own construct than on other constructs in the model. We also checked for multicollinearity and the resultant variance inflation factor (VIF) values for all of the constructs, and the results are acceptable (between 1.501 and 2.074). In short, all the items demonstrate satisfactory convergent and discriminant validity.

4.2. Assessment of the structural model

Next, the variance explained (R^2) by each path was examined. The percentages of the variance explained (R^2) by trust and TTF are 37 and 40%, respectively. The R^2 value for EKR usage is 0.51, indicating that approximately 51% of the variance in the model is explained by trust, task-technology fit and EKR self-efficacy.

The hypotheses, the paths between the items, and the latent constructs were examined with LISREL 8.70. The model fit indices were within accepted thresholds. For models with good fit, chi-squared normalized by degrees of freedom (χ^2/df) should not exceed 5, non-normed fit index (NNFI) and comparative fit index (CFI) should exceed 0.9, and the root mean square error of approximation (RMSEA) should not exceed 0.08 [3]. For the current structural model, χ^2/df is 2.52 (χ^2 = 1645.94, df = 652), and NNFI and CFI were both 0.96. While the RMSEA is 0.089, slightly higher than the commonly cited threshold, it is still marginally acceptable.

Figure 2 shows the results of the path coefficients. Trust, TTF, and EKR self-efficacy all have positive relationships with EKR usage. Therefore, H1, H4, and H6 are supported. Furthermore, both social interaction ties and shared vision have positive relationships with trust. Therefore, H2 and H3 are supported. Finally, EKR characteristics and EKR self-efficacy have positive relationships with TTF, indicating that H5 and H7 are supported.

In addition, to test for the mediating effect of trust and TTF, the following series of regression models was estimated [33]:

$$Y = b_0 + b_i X + \varepsilon \quad \text{(a)}$$

$$Y = b_0 + b_i X + b_j Z + \varepsilon \quad \text{(b)}$$

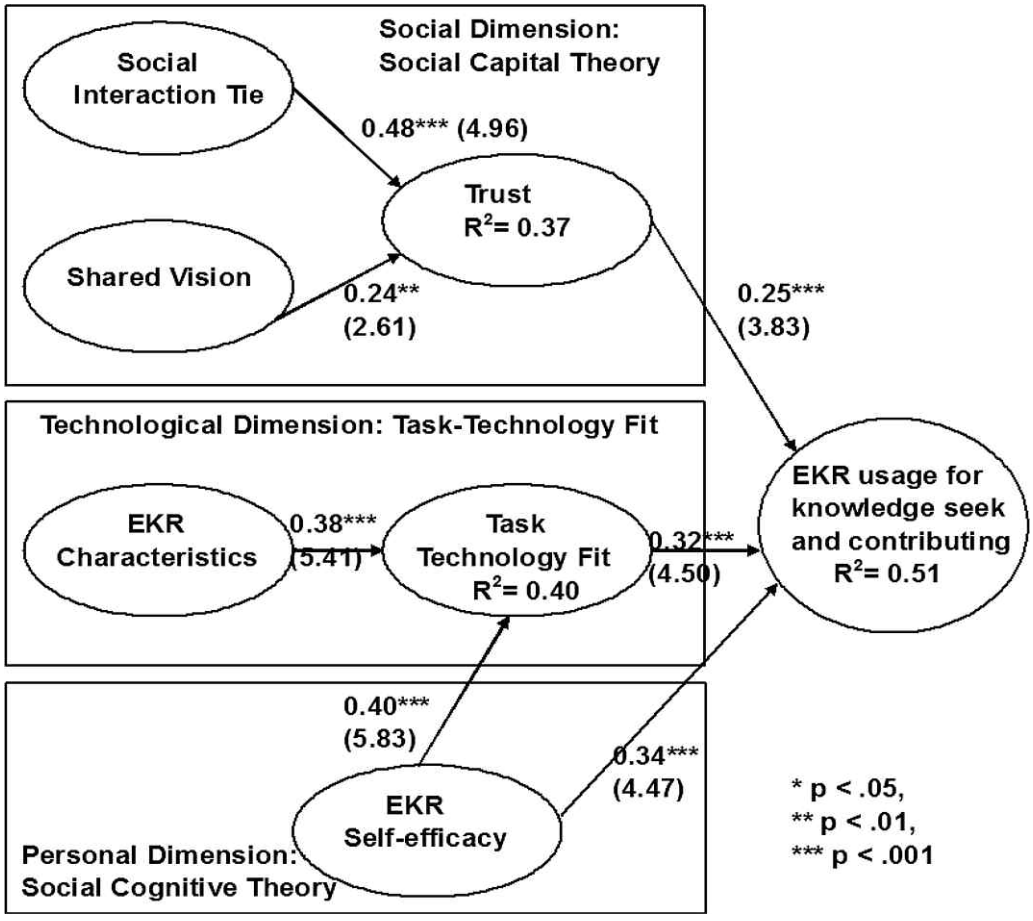

Fig. 2. Statistical results for the integrated structural model of EKR usage.

As decision criteria for the mediating impact of trust and TTF, four basic rules were applied in the analysis as follows [33]: (1) b_i, the beta coefficient for the original independent variable is statistically significant in regression (a); (2) in regression (b), b_j, the coefficient of the mediator variable is statistically significant; (3) the adjusted R^2 of regression (b) is greater than that in regression (a); (4) the significance of b_i in regression (b) is weaker than that in regression (a).

The results of the mediated regression analysis are shown in Table 5. The mediating effect of TTF is found to be significant. The mediating effect of trust, however, is found to be only partially supported, since shared vision is not significantly related to EKR usage.

5. Discussions and implications

Being the first to integrate the three distinct dimensions, this study provides a solid theoretical background to help managers and researchers better understand EKR usage or go further in attempting to design their EKR systems in an optimal way. While the three factors trust, TTF, and EKR self-efficacy all have positive relationships with EKR usage, our study results indicate that EKR self-efficacy wields the strongest influence, followed by TTF and then trust. Such comparative results substantiate the importance of self-efficacy in computing technology and usage. According to Compeau and Higgins [26], when people feel they are capable of using a computer system, they tend to prefer and even enjoy using that system; people cherish the feeling that they can master, and the feeling of mastering in turn breeds the behavior of more usage.

Table 5
Results of regression analysis (testing mediating effects)

Regression equation	Dependent variable	R^2 (adjusted)	*F*-value	β_i	*t*-Value
I. Testing the mediating effect of trust					
Equation (a)	EKR usage	0.241	31.331		
SIT				0.410***	4.941
SV				0.123	1.477
Equation (b)	EKR usage	0.349	35.197		
SIT				0.255**	3.127
SV				0.044	0.965
TRU				0.416***	5.70
II. Testing the mediating effect of TTF					
Equation (a)	EKR usage	0.422	70.820		
EKRSE				0.536***	9.066
EKRC				0.227***	3.830
Equation (b)	EKR usage	0.481	60.089		
EKRSE				0.412***	6.659
EKRC				0.109	1.784
TTF				0.318***	4.744

SIT = Social interaction ties; SV = Shared vision; EKRC = EKR characteristic; EKRSE = EKR self-efficacy.
*** $p < 0.001$; ** $p < 0.01$

TTF has been combined with numerous other theories, such as TPB [2], to make up for its deficit in social perspective concerns. In this study, we bridge the gap of social perspectives, lacking in TTF, by coupling it with social capital theory. Compared with technological and personal determinants, trust has the least influence on EKR usage for contributing and searching knowledge. This is not surprising. Knowledge sharing concerns the intrinsic willingness for an employee to contribute his or her knowledge, so trust is naturally important at the beginning for knowledge contribution [3]. However, once trust has been built and the relationships between employees are no longer tense or precarious, trust will give way to other influences which potentially loom larger in the overall process of EKR usage [3]. Nonetheless, we have made concrete suggestions on how to increase trust by enhancing social interaction relationships, and through solidifying the shared vision.

In the technological dimension, our research provides a guideline for diagnosing problems where employees use EKRs only rarely from EKR functionality perspectives. The 17-item EKR TTF instruments (EKR characteristics and task technology fit) are shown to produce acceptable reliability estimates, and the empirical results support their content validity, convergent validity, and discriminant validity. The EKR TTF measurements can be utilized to assess the design, construction, and implementation of organizational knowledge management systems so as to build successful EKRs.

In the personal dimension, it is helpful to bear in mind that self-efficacy plays the most important role of the three perspectives. Training programs which teach employees how to search effectively for the information they need are a useful way to strengthen efficacy expectations [25]. Through continuous training, people attain their goal and enhance their self-efficacy in EKR usage. According to Bandura [34], enactive attainment 'provides the most influential source of efficacy information because it can be based on authentic mastery experiences'. Most important of all, training employees how to use an EKR system will lead them to the wealth of knowledge 'hidden' in the process of using EKRs, and the training programs can also help the participants access that knowledge quickly and efficiently.

6. Theoretical and practical contributions

Effective usage of EKRs is often hindered by a combination of organizational, task, and technological factors [35], which would call for a socio-technical perspective on dealing with the problem [2].

With our integrated model, managers will have a quick grasp on which enablers are critical for EKR usage. The theoretical contributions of this study are mainly as follows. Firstly, this study supports the argument for using the socio-technical perspective to view EKR usage from several angles at the same time. Secondly, the inclusion of EKR characteristics and functionalities, which have seldom been discussed previously, within the technical perspective both strengthens traditional EKR usage models and extends this topic to a broader view. Thirdly, the inclusion of both contributing and searching activities in EKR usage are similar to the inclusion of EKR continual usage, and thus give a more realistic impression of EKR usage. Fourthly, the three dimensions are compared and their impact on EKR usage is ranked, which may facilitate managerial decisions on EKR issues.

In addition, this research ventures to offer some useful suggestions to the EKR managerial personnel and practitioners. Firstly, the EKR TTF instruments have been shown to produce acceptable reliability estimates, and the results support their content validity, convergent validity, and discriminant validity. These measurements can be utilized to assess the design, construction, and implementation of organizational knowledge management systems to build successful EKRs. To enhance the fit between technology and task, EKRs should be made versatile by providing a range of functions to match the individual tasks. Secondly, a set of well-designed training programs is necessary, to heighten self-efficacy. Additionally, the organization should allow its employees to use EKRs in their slack time in the office to ensure the easy accessibility of, and familiarity with, their EKRs (after all, few employees would use the systems, no matter how good they are, when it is their free and resting time at home). All the available hardware, software, and web resources pertinent to EKRs should be made open to the users. Through excellent training, frequent use, and sufficient resources, the EKR users' confidence and willingness to use will be greatly enhanced. In summary, this study helps organization managers set up policies and take corrective actions that would make employees not only willing to use EKRs, but also to enjoy doing so.

7. Limitations and suggestions for future research

Although this study has offered insights into EKR usage, it has some limitations, as do most field surveys. First is the matter of measurement of EKR usage. This study is based on the participants' self-determined answers, suggesting that further study may be needed to include some qualitative data to extend its validity, e.g., calculating the EKR usage volumes using log files. Since the participants are widely scattered in numerous companies and in different industries throughout Taiwan, qualitative data would not be easy to gather. Secondly, although this study includes international companies, they are still located in Taiwan. Future study is required to include companies based elsewhere to increase the external validity of the results and to avoid the influence of cultural factors. Finally, a larger sample that brings more statistical power would have allowed room for more sophisticated statistical analysis, though the 194 respondents of the current study do reveal several significant results.

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