

The impact of team task and job engagement on the transfer of tacit knowledge in e-business virtual teams

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Abstract This research focuses on the initiative to integrate team task and job engagement as related to the transfer of tacit knowledge. The aim of this study is to investigate if team task and job involvement enhances the overall work efficiency through transfer of tacit knowledge between e-business virtual teams. We develop a model that is based on the relationship between tacit degree of knowledge, job engagement, team tasks, and their effect on knowledge transfer. The conceptual model is validated with the data collected from a survey. The results indicate that the tacit knowledge does not have a positive effect on team tasks and job engagement, and the team tasks and job engagement have a significant positive effect on knowledge transfer. In addition, the study found that team tasks and job engagement have mediating effects in the process of tacit knowledge transfer. Also, we discuss the theoretical and practical implications and contributions of this study.

Keywords Tacit knowledge · Team task · Job engagement · Knowledge transfer

1 Introduction

New business opportunities have been created due to the rapid advancement and innovation in information and communication technology (ICT) [42, 43]. These changes have provided businesses new prospects in the global economy and ushered in the age of e-business [2, 5, 8, 11, 15–18, 26, 28, 40]. e-Business relates to the growth and development of new and existing businesses in which electronic transactions are increasingly facilitated in enterprises. According to Internet Data Center (IDC), online shopping transactions in China reached their highest levels in 2011 totaling 784.93 billion RMB. This was a growth of 66 % above the 2010 transaction figure which is far more than China's total retail sales of social consumer goods real growth rate of 11.6 %. Currently, the Chinese online shopping transaction volume only accounts for 3 % of the total social retail goods, which is a small fraction when compared with developed economies such as US and Japan. However, China has a very large spatial space and thus is extremely conducive to an increasing trend with respect to the size of online shopping transactions. By the end of last year, there were a total of 150,000 e-commerce enterprises that had been registered and established in China. However, e-commerce is just a part of e-business, and the e-business got a staggering growth since its birth in 1990s.

Enterprises in China that have adopted the e-business model either established their own e-business teams or outsourced the e-business endeavor to third party providers having the capability of performing e-business transactions. This practice is not just limited to the enterprises in China but also to the e-business in the rest of the world. However, regardless of the type of approach that was adopted for the implementation of e-business, the activities

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of e-business team is not just limited to the face-to-face communication but on the entire network. These activities have the typical characteristics of a virtual team which imply that the members of the team can break up the boundaries of time and space to communicate with each other online and the information can be transferred successfully on a one-to-one, one-to-many, and many-to-many basis. Romer [30] and Lucas [20] proposed their economic growth theories in which they considered knowledge as an independent endogenous variable and showed that it can improve the investment performance and energize the growth of business. Grant [7] thought that knowledge resources are the strategic resources of the enterprise. Furthermore, it was indicated that knowledge determines the enterprise's core capability. Kogut and Zander [14] indicated that enterprises enhanced their competitive advantages by knowledge transfer and the effective use of new knowledge. Hence, when enterprises conduct the e-business activities, it is imperative to pay attention to the use of ICT and Internet to assist the tacit knowledge transfer that can have an important effect.

The remainder of this paper is organized as follows. In Sect. 2, we review previous work about knowledge transfer, and discuss the variables such as team task and job engagement. In Sect. 3, we present our framework and the hypotheses associated with the proposed model. In Sect. 4, we present the data collection approach and methodology used. In Sect. 5, we analyze and discuss our results. Finally, in the last section, conclusions are provided and the future research are discussed.

2 Research background

Polanyi [27] was the first to segregate knowledge into explicit knowledge and tacit knowledge while pointing out that “we can know more than we can tell”. The term tacit knowledge can also be termed as subjective knowledge or knowledge that is related to the practical aspects of the work environment. Lubit [19] showed that tacit knowledge was difficult to learn but the transfer of tacit knowledge played a key role in nurturing companies' competitive advantage and innovative activities. There is an abundance of scholarly work in literature that has focused on the study of tacit knowledge from different perspectives. Nonaka [24] proposed the well-known Socialization-Externalization-Combination-Internalization (SECI) model which explored the relationship between explicit and tacit knowledge. According to the SECI model, Bolisani and Sacro [1] found that the application of information technology played an important role in the process of knowledge transfer and that different information technologies supported different types of knowledge transfer such as

Electronic Data Interchange (EDI) was quite useful for explicit-to-explicit knowledge transfer. The effect of information technology to assist the tacit knowledge transfer is limited mainly due to the characteristics associated with tacit knowledge and the lack of appropriate information technology. Song et al. [33] summarized that “in the past, a primary strategy for ensuring a high level of knowledge dissemination was the co-location of R&D staff” inferring that organizations had long relied on the need of physical proximity to stimulate knowledge transfer. This further implies that a team whose members communicated with each other on a face-to-face basis perhaps was more powerful in the decision-making process.

When one compares the traditional communication technology to the new Internet-based technology, it became obvious that the concept of the team workspace has been evolved. This new team workspace environment helps to improve the ability of information technology to act as an intermediary in the process of tacit knowledge transfer which facilitates the desired transfer of tacit knowledge effectively to the e-business team. The virtual e-business teams can be established based on Internet technology to aid the enterprises accomplish the specific tasks even though the employees are physically not in the same spatial location. The virtual team is the product of the Network Economy and the members of virtual team are scattered in different places that cooperate to accomplish the desired tasks in a collaborative manner [36, 37, 44]. Martin et al. [21] defined the virtual team as “teams whose members use technology to varying degree in working across location, temporal, and relational boundaries to accomplish an interdependent task”. Members of these virtual teams generally have different knowledge bases, varying skills and information, sometimes they even do not come from the same organization, but they have a common target which is the required or assigned task. However, Su [34] found that during the process of tacit knowledge transfer, the e-business partners often are faced with the intellectual property issues. Hence, the initiators of knowledge tend to take various measures to prevent intellectual property disclosures. This causes a negative effect on the transfer of tacit knowledge. Numerous researches have verified that some factors can assist in reducing this negative effect such as trust [31]. In our research, we introduce two exogenous variables adapted from previous research which are team tasks and job engagement to explore this process.

3 Model and hypothesis

In this section, we present our model and also develop the hypotheses used in our study.

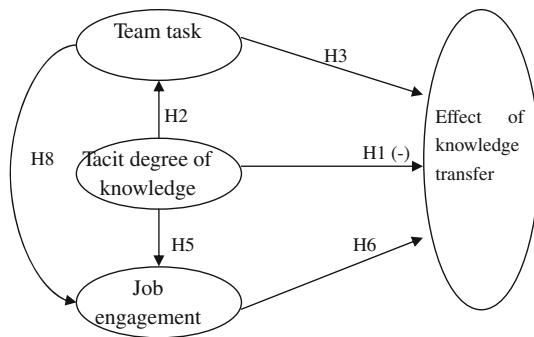


Fig. 1 Research model

3.1 Research model

Hatch and Dryer [10] indicated that the effective management of knowledge can increase the sustainable competitive advantages for the organizations. Thus, in this work, we pay special attention to the process of knowledge transfer, especially tacit knowledge transfer. In our research, we consider team task and job engagement to explore the tacit knowledge transfer process among e-business virtual teams. Our model is shown in Fig. 1. The model is based on four variables which are team tasks (TT), job engagement (JE), tacit knowledge (TK), and knowledge transfer effect (KT). The model will assist us to study how team task and job engagement affect the tacit knowledge transfer based on information technology and Internet.

3.2 Research hypotheses

For explicit knowledge in the form of images, text, and audio, information technology plays an important role in the retrieval, transfer, sharing, and storage of knowledge. Information technology can help to reduce the time of knowledge transfer and increase the frequency of knowledge transfer, whereby facilitating the successful transfer of knowledge. On the contrary, the process of tacit knowledge transfer is quite difficult as it can be achieved by doing and not transcribing. Nonaka [25] indicated that the tacit knowledge is generally difficult to formalize; however, in many situations, metaphor, analogy, and model are ideal ways for converting tacit knowledge into explicit knowledge. Therefore, we consider that the tacit knowledge is more difficult than the explicit knowledge to transfer successfully even with the use the information technology and Internet. Hence, we assume that the tacit degree ascertain the difficulty level of the knowledge transfer. Therefore, we propose:

H1 The tacit degree of knowledge is negatively related to the effect of knowledge transfer.

Advances in information technology have had a positive impact on the transfer of information among collaborating teams. For example, the multiple media applications provide convenience for the transfer of tacit knowledge among the e-business virtual teams. Dyerson and Mueller [4] showed that if employees feel that sharing knowledge with each other will reduce the value of their proprietary knowledge, they will prefer to stop such activities. When compared to explicit knowledge, tacit knowledge belongs to the individual as proprietary knowledge; however, as virtual teams do not communicate face to face with each other, it can be opportune for the team members to take the obstinate actions. So, we can assume that the degree of the tacit knowledge has a negative impact on the establishment of team task. Therefore, we propose:

H2 The tacit degree of knowledge is negatively related to the establishment of team task.

Many scholars have explored the process of knowledge transfer. Dyer and Nobeoka [3] indicated that the membership of strong ties in social network has a high degree of trust, and thus conducive for information and knowledge transfer. Furthermore, Hansen et al. [9] pointed out that strong ties provided a basis for the common language to emerge and improve the communication efficiency, thus indicating that a strong relationship among team members can lead to a much clearer understanding of tacit knowledge transfer. On the other hand, according to van der Aa and Elfring [39], strong ties are an impetus for tacit knowledge transfer whereas weak ties are more suitable for explicit knowledge transfer. In our study, we consider that the e-business virtual teams can lead to a relationship of strong ties by relying on information and technology which provides a real-time and flexible form of communication. According to Quesada et al. [29], team interaction has a positive influence on complex problem-solving. Wei and Wang [41] further indicated that the team task can create an atmosphere for the formation of a friendly relationship among the members and such a relationship has a significant and positive effect on knowledge transfer. Therefore, we propose:

H3 Team task is positively related to the effect of knowledge transfer.

H4 Team task mediates the relationship between tacit knowledge and the effect of knowledge transfer.

The concept of job engagement is relatively new and was first introduced by Kahn [12] as team members manage themselves to coalesce and accomplish the role of the job. In a later publication, Kahn [13] maintained that high job engagement means that individuals could express themselves from three levels in the process of role-playing

at work which are physical, cognitive, and emotional. Schaufeli et al. [32] defined this as “a work-related positive, perfect emotional, and cognitive state”, since job engagement could be construed as a positive experience. It reflects the high-energy level and a strong sense of identity, focus, and without any slack.

To the best of our knowledge, there is no published work available that addresses the relationship between tacit knowledge and job engagement. However, we conjecture that there is such a relation in practice because of the characteristics of tacit knowledge, the presence of new technologies can be utilized to improve the effect of tacit knowledge transfer. As a result, the members of e-business virtual teams will engage in communicating with words, images, and videos due to the lack of face-to-face communication. This interaction will have a negative impact on the degree of job engagement. Therefore, we propose:

H5 The tacit degree of knowledge is negatively related to job engagement.

Furthermore, research work on the relationship between job engagement and knowledge transfer is quite limited. In Schaufeli’s study, they confirmed that job engagement had a positive effect on the organization performance. As discussed earlier, knowledge transfer can improve the organization performance, thus we can infer the relationship between job engagement and knowledge transfer. Therefore, we propose:

H6 Job engagement of e-business virtual team is positively related to the effect of knowledge transfer.

H7 Job engagement mediates the relationship between the tacit degree of knowledge and the effect of knowledge transfer.

According to George and Jessup [6] and other researchers, virtual team is a work method which places people with various knowledge and skills together to perform a task [36, 37, 44]. In addition, Townsend et al. [38] conducted a study to explore the characteristics of virtual team and considered that the virtual team having three characteristics namely dependence, network, and goal orientation. As mentioned above, the team tasks of e-business virtual team affect the degree of job engagement. Therefore, we propose:

H8 The team task is positively related to job engagement.

4 Questionnaire design and response

In this section, we briefly present the measurement instrument and sample information.

4.1 Questionnaire design

To enhance validity, we relied on existing scales in the literature to develop the survey questions. The measurement for tacit degree of knowledge was adapted from Zander and Kogut [45] to fit three dimensions, i.e., Perceived codifiability, Perceived teachability, and Imitability. The measures of team task include collaboration, coordination, consultation, and support dimensions. Effect of knowledge transfer was measured with items developed based on Szulanski’s “knowledge receiver’s satisfaction” [35], Nonaka’s “fluent degree of knowledge transfer” [23], and Nelson’s “the abilities of creating and acquiring new knowledge” [22]. Job engagement was measured with items adopted from the Utrecht Work Engagement Scale [32], which can be divided into energy, devotion, and concentration dimensions. All items were on a 7-point Likert scale ranging from 1 denoted as strongly disagree to 7 defined as strongly agree.

4.2 Response

Data for validating the research model were collected using a paper-based survey on a voluntary basis from working professionals in China, all of whom were also MBA students at a certain university. Majority of the survey participants were engaged in the management positions with ages ranging from 25 to 40, employed in enterprises carry out e-business, and 38 % of the respondents were division managers.

5 Data analysis

In this section, we provide the details associated with our data analysis.

5.1 Reliability and validity

In order to test the reliability and validity of the questionnaire scales, a pre-test was conducted with 57 questionnaires. Using SPSS 18.0, a factor analysis was performed to test the validity. The reliability results show that the Cronbach’s α of tacit degree of knowledge, team task, effects of knowledge transfer, and job engagement are 0.818, 0.835, 0.912, and 0.971 respectively. Studies have indicated that as a scale with about 10 items, the Cronbach’s α should be above 0.80, which is true for all and hence, we conclude that our scales are reliable.

On the basis of the pre-test, a formal survey was conducted to further the study. A total of 260 questionnaires were distributed and 211 of them were considered acceptable for use, thus providing a response rate of

81.2 %. Again, a confirmatory factor analysis was conducted to test the reliability and validity of all samples. AMOS 18.0 was used based on the maximum likelihood method. The results of the path coefficient between observable variables and latent variables are depicted in Table 1. All the results are significant ($p < 0.05$, $t > 1.96$), and all the factors loadings were greater than 0.5, thus providing significant results and also validating our model.

As AMOS report does not provide composite reliability, we used SPSS 18.0 to perform this test. The results associated with the Cronbach α are 0.627, 0.843, 0.851, and 0.814. It can be noticed that the values of Cronbach’s α are reduced from the previous test case but still greater than 0.6. The values of reliability of individual observable variables are acceptable as long as they are above 0.50, and the values of composite reliability to be acceptable when it is above 0.60. Based on these observations, we conclude that the reliability test is passed.

5.2 Results and discussion

SPSS 18.0 was employed to determine the mean values associated with the four variables as well as the Pearson correlation between the four variables to ascertain about the relationship between the four variables. Table 2 shows the means, standard deviations, and the Pearson standardized correlation coefficients associated with the four

variables. From Table 2, it can be seen that there is a relatively a significant correlation between each of the four factors of the degree of tacit knowledge, team tasks, effect of the transfer of tacit knowledge, and job involvement, at the 0.01 level. The correlation coefficient does not exceed 0.5.

An additional analysis was performed using AMOS 18.0 to determine the relationship between the degree of tacit knowledge, team tasks, effect of the transfer of tacit knowledge, and job engagement. In the model fitting index, CMIN/DF = 2.884, which should be between 1 and 3; IFI = 0.909, which should be greater than the critical value of 0.9; CFI = 0.908, which should be greater than the critical value of 0.9. Thus, indicating that the model has a good fit. The path coefficients of the model are shown in Fig. 2.

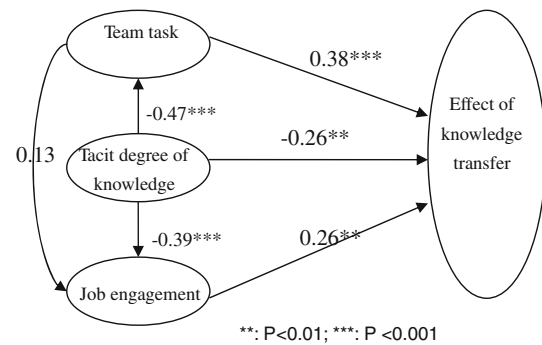


Fig. 2 The path coefficients of the model

Table 1 Factor loadings between observable variables and latent variables

Latent variables	Observable variables	Factors loadings	Latent variables	Observable variables	Factor loadings
The tacit degree of knowledge	Perceived codifiability	0.51	Effect of knowledge transfer	Satisfaction	0.69
	Perceived teachability	0.76		Performances	0.89
	Imitability	0.59		Creation	0.86
Team task	Coordination	0.77	Job engagement	Energy	0.82
	Consultation	0.89		Devotion	0.77
	Support	0.70		Concentration	0.72
	Views exchange	0.65			

Table 2 Pearson correlation coefficient

	Mean	Standard deviation	1	2	3	4
The tacit degree of knowledge	3.621	0.964	1			
Team task	4.736	1.182	-0.368**	1		
Effect of knowledge transfer	4.424	1.063	-0.461**	0.494**	1	
Job engagement	4.740	1.087	-0.332**	0.249**	0.430**	1

** $p < 0.01$

From the viewpoint of the path coefficients of the model, the tacit degree of knowledge has a significant negative impact on the effect of knowledge transfer ($\beta = -0.26, p < 0.01$), implying that as the tacit degree of knowledge increases, the effect of knowledge transfer gets worse. On the other hand, the team task has a significant positive impact on the knowledge transfer ($\beta = 0.38, p < 0.001$), indicating that the established business virtual team can provide a positive effect on knowledge transfer. Also, the tacit degree of knowledge has a significant impact on team task, again implying that as the level of tacit degree of knowledge increases, the level of cooperation among e-business virtual team decreases. These results support our hypothesis H1, H2, and H3.

At the same time, combined with the support of hypothesis H1, H2, and H3, it is observed that there is a significant correlation between the tacit degree of knowledge and the team task, the team task and effect of the knowledge transfer, the tacit degree of knowledge and effect of knowledge transfer. Therefore, our hypothesis H4 is supported, that is, the team task plays a partial intermediary role between the degree of tacit knowledge and the effect of knowledge transfer. The intermediary effects are shown in Table 3.

In addition, the tacit degree of knowledge has a significant impact on job engagement ($\beta = -0.39, p < 0.001$), suggesting that as the level of the tacit degree of knowledge increases, there will be a lower level of job engagement associated with the e-business virtual team members. In addition, job engagement has a significant impact on the effect of knowledge transfer ($\beta = 0.26, p < 0.01$), indicating that as the level of job involvement rises, there will be an enhanced effect of knowledge transfer. Therefore, the hypotheses H5 and H6 are fully supported from these results.

At the same time, combined with the support of hypothesis H1, H5, and H6, it can be concluded that there is a significant relationship between the tacit degree of knowledge and job engagement, job engagement and the effect of knowledge transfer, the tacit degree of knowledge and the effect of knowledge transfer. Once again, this supports our hypothesis H7, which is that the job involvement plays a partial intermediary role between the tacit degree of knowledge and effect of knowledge transfer. The effect is shown in Table 3.

Finally, based on our analysis, it can be seen that the team task has no significant effect on promoting job

engagement. However, due to the value of $\beta = 0.13$, we can conclude from our work that the team task has no negative effect on job involvement, and this would be left for future work.

6 Conclusions and future research

The aim of this paper was to investigate the relationships among tacit degree of knowledge, team task, job engagement, and effect of knowledge transfer. In addition, we confirmed the presence of two intermediates in the process of knowledge transfer. We can summarize our findings based on our analysis as:

1. According to previous research and our study, tacit knowledge is difficult to share and transfer. For the e-business virtual team, the proprietary of the tacit knowledge has a negative impact on the willingness of sharing and transferring implying that there is lower level of cooperation and the team task may not be accomplished in a successful manner. However, team task contributes to the effect of knowledge transfer and plays a partial intermediary role in this process. Hence, we can draw the conclusion that managers should realize the possibility that members of e-business virtual team are not willing to transfer their tacit knowledge voluntarily. This may be especially the case when there is an abundance of tacit knowledge and hence, a much closer attention may be required for the completion of the team task. Harmonious atmospheres, common goal, reasonable compensation, fair contribution measurement maybe useful for the establishment of team task and consideration of these factors undoubtedly are the issues managers will face with their organizations.
2. As an antecedent, job engagement has a positive impact on the effect of knowledge transfer for the e-business virtual team and it also plays a partial intermediary role in the tacit knowledge transfer process. Thus, we can conclude job engagement can help the transfer of tacit knowledge. Due to that the job engagement is often measured by vigor, devotion, and concentration, if the managers want to improve the job engagement level and help the tacit knowledge transfer successfully, then measures such as support and trust maybe useful measures that should be taken into account by the managers for achieving the goals of their organizations.
3. In addition, we found that the tacit degree of knowledge has a negative impact on the team task. In contrast to the face-to-face team environment, e-business virtual team has its own unique characteristics.

Table 3 Intermediary effect

Effect	Direct effect	Mediating effect	Total effect
Team task	0.38	0.12	0.50
Job engagement	-0.26	-0.10	-0.36

E-business team members are typically under a heavy psychological stress because their communication with each other depends on the information technology and when they face certain obstacles in the process of knowledge transfer, they might get disenchanted which might lead to disappointment and eventually job burnout. Thus, it is imperative that managers arrange a reasonable work period, provide enough down time to the members so that the members do not get astray from the task at hand in this fast-paced global work environment even they have the convenience of information technology.

4. Furthermore, in this study, the analysis did not support the relationship between team task and job engagement. This may have been due to the cultural aspect of collectivism which has roots in Chinese culture. Chinese enterprises usually pay more attention on motivating team as a whole rather than motivating an individual which can result in the problem of free ridership whereby reducing the level of cooperation of team task within the organization. Hence, we suggest that the Chinese managers design an approach to motivate not just the team but also at the individual level. This approach will further enhance the performance and completion of the task by the team.

There are a number of limitations that are associated with this study. First, the scale of tacit degree of knowledge was translated directly from the western aspect and literature. Although some items were modified to address the issues and practices in Chinese organizations, we found that the reliability and validity were not sufficiently strong when associated with the scales of team task, effect of knowledge transfer, and job engagement. Second, there are certain limitations related to the respondents of the survey as they were all from a MBA class. Although the respondents were associated with different enterprises, but most of them worked in the same province. Therefore, future research can consider these two aspects by expanding the scope of the sample to include team members from different provinces and industries as well as developing a new scale of tacit degree of knowledge with a higher level of reliability and validity so as to be more applicable to the conditions in China.

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