Knowledge Sharing through Web-Based Learning Systems

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ABSTRACT

Many organizations understand the importance of knowledge sharing among their employees. They are eager to introduce knowledge management paradigm to facilitate the sharing of knowledge in their organizations. However little is known about the determinants of the individual's knowledge sharing behavior. Taking knowledge management as an approach to e-learning, the purpose of this study is to understand the factors of knowledge sharing behavior through the investigation of individual's acceptance to an interactive web-based learning system in a training program. This study also examines the interactions in an e-learning platform in order to explore the motivators and inhibitors of the knowledge sharing process involved.

INTRODUCTION

Today, the learning process is becoming a vital factor in business and socioeconomic growth where the role of information and communication technology (ICT) is having a growing and an innovative impact (Kamel, 2002) and the e-learning plays a key role in the marketplace of organizational learning. New approaches to e-learning include online training and knowledge management (Rosenberg, 2001).

As a crucial element of organizational learning, knowledge management life cycle involves: (1) knowledge capture, (2) knowledge sharing, (3) knowledge application, and (4) knowledge creation (Liebowitz, 2001). To make sure that knowledge capture in the training program can well be applied in to workplace, knowledge sharing becomes a critical step before further in the knowledge management life cycle. Employee gets new knowledge from different means including training. However, whether this captured new knowledge can be fully externalized into workplace is in doubt.

In the study of executive management knowledge taxonomy, employee sharing is under innovation and learning as among one of the major knowledge categories, together with learning process, fostering learning, managing knowledge and knowledge building. Current literature suggests that sharing as one of the key steps in knowledge management methodologies (Liebowitz, 2000; O'Dell, 1996).

Knowledge is a social phenomenon (Brown & Duguid, 2000). Thus, knowledge involves people. More and more studies found that it is not just a transfer of information but also a process of knowledge creation. Studies found that the weaknesses of knowledge management may involve poor understanding of cultural or organizational issues, and no support for valuing knowledge assets (Liebowitz, 2001).

Unlike individual knowledge, social knowledge is not guaranteed through the physiological mechanisms associated with human cognition (Nonaka & Nishiguchi, 2001, p.33). Social knowledge is shared among organizational members. Based on individual experiences of shared organizational events, social knowledge allows organizational members to share rules in the form of practices. In this sense, social knowledge brings forth an organizational world that is accessible to the individual organizational member and lends itself to individual knowledge development. Individual knowledge is needed for the creation of an organizational world, and this world, in the form of social knowledge, is in turn needed for the creation of individual knowledge about this world.

Peer to peer interactions facilitate knowledge sharing. Further, interactions between top management and employees also matter. Armstrong and Sambamurthy (1999) find that top management teams and their informal interactions with employees enhance their knowledge, particularly their business knowledge.

What incentives are effective in encouraging knowledge sharing in organization? Bock & Kim (2002) found that expected associations and contribution are the major determinants of the individual's attitude toward knowledge sharing, where expected associations refers to that employees believe they could improve relationships with other employees by offering their knowledge and expected contributions refers to that employees believe they could make contributions to the organization's performance. Expected positive attitude toward knowledge sharing is found to lead to positive intention to share knowledge and finally, to actual knowledge sharing behavior. Morris et al. (2002) emphasized that organizations must consider both the level of trust among colleagues and the users' satisfaction with the information technology on which virtual teams rely.

Could a web-based learning system create enough motivation to the sharing of knowledge? Interestingly, a number of studies from a vast countries conducted in the last few years found the same phenomenon that discussion forum feature in a web portal received the lowest participation rate, compared with other common features, including document management, news, announcement, mailing lists, calendar, and files and resources (Peters et al., 2003; Serrano et al., 2003).

Many organizations understand the importance of knowledge sharing among their employees and are eager to introduce knowledge management paradigm to facilitate the sharing of knowledge in their organizations. However little is known about the determinants of the individual's knowledge sharing behavior. The purpose of this study is to understand the factors of knowledge sharing behavior through the investigation of individual's acceptance to an interactive web-based learning system in a training program. This study also investigates the interactions in a community-oriented e-learning platform in order to explore the motivators and inhibitors of the knowledge sharing process involved.

METHOD

Interactive Training Program for School Teachers

In response to the challenges of the knowledge age, a number of policies on ICT in education have been produced in many countries (Pelgrum & Anderson, 1999). Such policies reveal that educational innovations in ICT have been increasingly embedded within a broader framework of education reforms that aimed to develop students' capacities for knowledge skills (Yuen, Law & Wong, 2003). During the period January and May of 2003, a research and development centre for information technology in education at a university in Hong Kong was commissioned by the government to organize a series of training events for local primary and secondary school teachers. The name of the training program is called "Interactive Learning and Teaching with ICT." Each training event is organized as a two 3-hour sessions with online web sessions for about 20 participants. It is conducted mainly in Chinese, supplemented with English if necessary. The aims of the training program were: (1) To provide an introduction to various approaches of learning and teaching with ICT that could be adopted in Hong Kong schools; (2) To facilitate teachers to integrate ICT effectively into their classroom; (3) To provide the rationale and justifica-

tions for integrating ICT into a particular learning and teaching situation through local examples and case studies; and (4) To provide the techniques and procedures involved in carrying out integration project through local examples and case studies.

Web-based Support Training

The training program was constructed on the web-based course support platform called Interactive Learning Network (ILN), a community-oriented learning management system developed by the research and development centre. It is an online environment aims at equipping instructors with the tools to provide scaffoldings for participants to engage in collaborative and cooperative activities. It allows users to interact with each other through synchronous communication simultaneously, or asynchronous communication any time at their own convenience. Built-in features include announcement, resource, task, forum, calendar, chat-room, quiz, and evaluation. Instructor can customize features on his/her community as well. Forum is one of the features in ILN and is a place for open discussion. All participants can post and read messages. In the design of the training program, there is a web-based discussion forum session and participants are required to participate.

In between the two training sessions with a minimum of 6-day intervals, the instructor will motivate and monitor the online web-based discussion forum in order to guide the participants to explore the current topics they learn during the first training session. This involves the internalization process of each participant to think the "how" and "why" of what they have learned as effective to his/her job performance. Each participant is encouraged to search for evidence to support his/her claims. The participants are expected to share and discuss their own views through a designated time on the web-based discussion forum of the ILN of the training program.

Framework of the Study

The research model includes various constructs based on the technology acceptance model (TAM) by Davis (1989). The determinants to be investigated are perceived usefulness and perceived ease of use. The dependent variables are the intention to acceptance and satisfaction to the course. Attitude is introduced to investigate the mediating effect of it on intention and the moderating effect of the treatment training is also under investigation. On the other hand, we will also analyze the interaction logs in the web-based platform in order to investigate the behavior in such an interaction.

This study investigates a training program organized for primary and secondary school teachers on how to integrate ICT in their daily teaching. They are provided with a web-based learning network for them to share files and resources, mailing lists, to discuss with instructors and other participants. A questionnaire survey was introduced to the participants of the training program both before and after the training sessions in order to investigate the determinants to the acceptance of this interactive web platform. Data (n=74) were collected from the participants in the first batch of the training course.

RESULTS

Research results from the field survey gives us a better picture to the major determinants of the individual attitude toward acceptance of an e-learning platform, which facilitates knowledge sharing. The analysis of the interaction logs in the web-based platform provides us hints on the pattern and behavior of individual who participate in such a knowledge sharing process. Findings are presented as followings.

Summary of Observable Variables

The descriptive statistics of the demographic variables show that most participants were experienced teachers with reasonable computer competence. There are 47 (63.5%) female and 27 (36.5%) male teachers with age groups: less than 25 (2.7%), 25-29 (18.9%), 30-35 (13.5%), and over 35 (64.9%). More than 86% teachers reported that they accessed to the ILN after the training. The descriptive statistics of the online activities show that the number of read message (Mean=59.4, SD=57.9) was the most prominent behavior of knowledge sharing over

Table 1: Result of Factor Analysis

| | Pre-training | | | Post-training | | |
| | Components | | | Components | | |
	1	2	3	1	2	3
PU1	**0.78**	0.10	0.26	**0.87**	0.20	0.27
PU2	**0.89**	0.15	0.24	**0.88**	0.24	0.20
PU3	**0.91**	0.20	0.18	**0.85**	0.28	0.28
PU4	**0.91**	0.18	0.06	**0.83**	0.28	0.22
PU5	**0.91**	0.21	0.17	**0.73**	0.10	0.35
PU6	**0.87**	0.15	0.20	**0.85**	0.28	0.15
PEOU1	0.19	0.18	**0.74**	0.29	**0.82**	0.03
PEOU2	0.31	0.16	**0.70**	0.30	**0.71**	0.32
PEOU3	0.26	0.23	**0.76**	0.18	**0.62**	0.29
PEOU4	0.14	0.22	**0.86**	0.30	**0.86**	0.21
PEOU5	0.06	0.12	**0.81**	0.10	**0.82**	0.25
ITU1	0.23	**0.84**	0.28	0.33	0.43	**0.71**
ITU2	0.15	**0.89**	0.12	0.34	0.12	**0.80**
ITU3	0.07	**0.90**	0.18	0.18	0.28	**0.87**
ITU4	0.16	**0.65**	0.28	0.12	0.49	**0.70**
ITU5	0.24	**0.84**	0.12	0.44	0.13	**0.83**
Eigen-values	7.754	2.629	1.910	9.041	1.968	1.540
% of variance explained	48.461	16.434	11.939	56.509	12.298	9.623

the ILN, whereas the number of login (Mean=5.5, SD=3.5) and number of post message (Mean=3.4, SD=3.1) are find comparatively small.

The descriptive statistics of the measurement items indicate that all the items show generally positive perceptions towards computer use, all mean scores over 4 in a seven-point Likert scale. The mean scores range from 4.72 to 5.66 while the standard deviations range from 0.81 to 1.26. All constructs satisfied the criteria of reliability (alpha > 0.85).

The factor components were then analyzed by a principal component factor analysis, with varimax rotation method. All the items have factor loadings over 0.62. Cumulative variance explained by the three components are 76.84% and 78.43% for pre-training and post-training respectively (Table 1). The components generated confirm the corresponding constructs as predicted by the TAM model.

Technology Acceptance

LISREL was used to run the Structural Equation Modeling for the causal model. The results show the path coefficients and the square multiple correlations for the structural equation. The models for both pre-training and post-training have close to the recommended values of both non-normed fit index and comparative fit index.

Figure 1 shows the resulting path coefficients of the pre-training and post-training model. For the post-training model, the result supported most of the individual causal paths postulated by TAM. This finding is consistent with prior research in general (Davis, 1989) except the path from perceived usefulness to intention to use in the pre-training model could not be clearly identified.
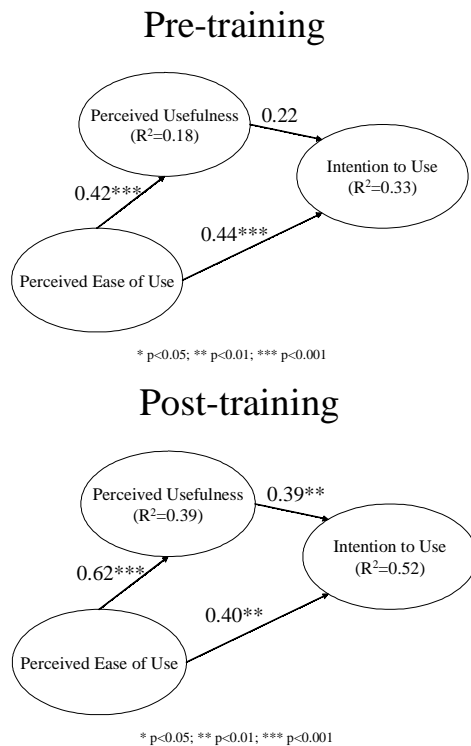
From the R square values, we find that perceived ease of use explain 18% and 39% (pre and post respectively) of the variance in perceived usefulness, while perceived ease of use and perceived usefulness together explain 33% and 52% (pre and post respectively) of the variance in intention to computer use.

Figure 1 also shows the path coefficients for each causal path in the pre and post models. All data segments provide an overall fit of the model postulated by TAM. However, compared to pre-training model, the post-training model placed a greater emphasis on perceived ease of use in determining perceived usefulness. On the other hand, the pre-training model weighted perceived ease of use more strongly in determining intention to computer use than the post-training model did. The causal path from perceived usefulness to intention to computer use is non-significant in the pre-training model.

Relationship between Technology Acceptance and Knowledge Sharing

The correlation between attitudes and behavior of knowledge sharing is shown in Table 2, in which knowledge sharing is defined as number of login, number of read message (receiving), and number of post message (giving) (Fullan, 2002). It was found that perceived ease of use and intention to use were positively correlated to the number of read message.

Figure 1: Pre-training and Post-training Model

Pre-training

* p<0.05; ** p<0.01; *** p<0.001

Post-training

* p<0.05; ** p<0.01; *** p<0.001

Table 2: Corrections between Attitudes and Knowledge Sharing Pre-training Correlations

Pre-training Correlations

	Login	Read	Post	PU	PEOU	ITU
Login	1.00					
Read	0.50**	1.00				
Post	0.45**	0.53**	1.00			
PU	0.12	0.02	0.08	1.00		
PEOU	0.00	0.08	0.11	0.46**	1.00	
ITU	0.19	0.27*	0.19	0.41**	0.47**	1.00

* $p<0.05$; ** $p<0.01$

Post-training Correlations

	Login	Read	Post	PU	PEOU	ITU
Login	1.00					
Read	0.50**	1.00				
Post	0.45**	0.53**	1.00			
PU	0.15	0.16	0.03	1.00		
PEOU	0.07	0.24*	0.10	0.56**	1.00	
ITU	0.16	0.26*	0.10	0.62**	0.61**	1.00

* $p<0.05$; ** $p<0.01$

we'll get" (Rosenberg, 2001; p.308). Regardless the revolution of new technologies, we need to continue and keep the people-centered nature of learning. Thus, the second challenge is the design of e-learning systems to provide authentic learning experiences for people to address various training needs.

This study attempts to explore the users' technology acceptance and found that perceived ease of use and perceived usefulness are the two independent variables towards technology use. It also reveals the relationship between technology attitudes and knowledge sharing. These findings are definitely important to the design of teachers' professional development courses. Viewing teacher training as a kind of remedy for teachers' inadequacy (Neil, 1986), teachers' technology training is, still in many cases, unified and one-off. Without a continuous development plan to teachers (Bradley, 1991), the problem of acceptance would still be an important barrier to the successful use of technology in education. The current study has collected the views of in-service teachers at a given point of time, however, studies find that the factors to pre-adoption and post-adoption may be different (Karahanna, Straub & Chervany, 1999; Bhattacherjee, 2001), that is, a factor contributes positively to acceptance may not necessarily contribute to the same extent and degree after adoption. Sometimes, on the contrary, a factor may hinder further technology use. The challenge is to reinvent teacher professional development in fostering knowledge sharing within and across schools (Fullan, 2002).

One-way ANOVA was employed to determine the mean differences between the different ITU groups. Respondents are classified into three groups, as high, medium and low in their total score on Intention to Use (ITU) (Five items in total, each is measured with seven point Likert scale). Using these groups as factors to find the dependent variables of the online participation activity, results show (Table 3) that there are significant differences in between the groups in predicting number of login (F=3.712, p<0.05); and read message (F=5.842, p<0.01).

DISCUSSION

The survey results give a quantitative view to the measurement of the determinants of the perceptions formed that affects the individual attitude to the e-learning platform which hence to the involvement of the individual to the whole knowledge sharing process. This study gives us a better understanding to the process of knowledge sharing using a web-based discussion forum. The pattern on how participants interact with each other gives us hints on the motivators to the knowledge sharing process. Nevertheless, the following challenges are arisen from the aforementioned study.

Education and training providers use progressively advanced methods to offer their services as new e-learning technologies are developed. To improve technology acceptance, in the past, attention has been given for developing better user interface. However, the importance of technology is its flexibility and vast functionalities. An e-learning platform could never be designed as a "simple" system, comparable to any other electrical appliances, such as a television set or a fridge. On the contrary, there are a lot of rooms to improve acceptance through a better understanding of user perceptions, as "user perceptions were instrumental in explaining a substantial proportion of the variance in both current use and future use intentions" (Agarwal & Prasad, 1997, p. 572). A number of issues can be drawn from these observations. Technology adoption of the users as well as staff in the training organization is considered as a major challenge to the development of e-learning within the organization.

In line with the first challenge, it is found that human interaction and sharing is crucial in the e-learning. "If e-learning does not have a human element – if people do not have opportunities to meet each other and work with each other, face-to-face or online – we may not like what

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