

Knowledge sharing and teacher acceptance of web based learning system

Allan H.K. Yuen

*Centre for Information Technology in Education
The University of Hong Kong*

Will W.K. Ma

*School of Business Management
Hong Kong University of Science & Technology*

In response to the challenges of the knowledge society, many organisations 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 organisations. However little is known about the determinants of the individual's knowledge sharing behavior. Taking the knowledge management as an approach to e-learning, the purpose of this case study is to develop an initial understanding of the factors of knowledge sharing behavior through the investigation of individual's acceptance to a web based learning system in a teacher 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.

Keywords: knowledge sharing, technology acceptance, web based learning, teacher training

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 organisational learning. New approaches to e-learning include online training and knowledge management (Rosenberg, 2001).

As a crucial element of organisational 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 externalised 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 (Goodman & Chinowsky 2000). Current literature suggests that sharing as one of the key steps in knowledge management methodologies (Liebowitz, 2000; Liebowitz & Beckman 1998; O'Dell 1996; Liebowitz et al. 2000).

Knowledge is a social phenomenon (Brown & Duguid, 2002). 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 organisational 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 organisational members. Based on individual experiences of shared organisational events, social knowledge allows organisational members to share rules in the form of practices. In this sense, social knowledge brings forth an organisational world that is accessible to the individual organisational member and lends itself to individual knowledge development. Individual knowledge is needed for the creation of an organisational 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 et al. (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 organisation? 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 organisation'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) emphasised that organisations must consider both the level of trust among colleagues and the users' satisfaction with the information technology on which virtual teams rely.

Could an online discussion forum 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; Schubert et al., 2003; Serrano et al., 2003).

Many organisations 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 organisations. However little is known about the determinants of the individual's knowledge sharing behavior. The purpose of this study is to develop an initial understanding of the factors of knowledge sharing behavior through the investigation of individual's acceptance to a web based learning system in a teacher training program. This study also investigates the interactions in a community e-learning platform in order to explore the motivators and inhibitors of the knowledge sharing process involved.

Teacher technology acceptance

The successful use of computers in the classroom depends on the teachers' attitudes towards computers (Lawton & Gerschner, 1982). Gressard and Loyd (1985) found that the perceived usefulness of computers can influence attitudes towards computers, and the amount of confidence a teacher possesses in using computers may influence his or her implementation in the classroom. Teachers' attitudes have not been emphasised in the implementation of ICT into the classroom, though studies stated that teachers' attitudes as well as knowledge and skills in using computers are major factors affecting their initial acceptance of computer technology and their future behavior regarding computer usage (Violato, Mariniz & Hunter, 1989; Koohang, 1989).

Summers (1990) found that the lack of knowledge and experience in the computing area is one of the most common reasons for teachers' negative attitudes towards computers. Teachers' attitudes towards computers affect their instructional use of computers and likelihood of profiting from training (Kluever, Lam & Hoffman, 1994). Russell and Bradley (1997) found that male teachers reported significantly greater confidence with computer than did females and recommended teacher professional development should take into account the particular needs of female teachers.

Teachers are often resistant to using computers in the classroom, so the development of teachers' positive attitudes towards computers is considered to be a key factor in fostering computer integration and the enhancement of quality learning and teaching using computers (Yuen, Law & Chan, 1999). In investigating the changes in pre-service and in-service teachers' attitudes towards computers, Yildirim (2000) found that teachers' attitudes (anxiety, confidence, and liking) significantly improved after the computer literacy course. Yuen and Ma (2002) found that the two independent variables, perceived usefulness and perceived ease of use, directly affect the intention to computer use as stated in the Technology Acceptance Model (TAM). Furthermore, significant gender differences in computer acceptance were also found.

In order to predict and understand teacher's computer use and acceptance, the need for a well defined framework is essential. The TAM, a well researched model, has been commonly applied in the development of constructs in computer acceptance or attitude scales in many studies (Davis, 1989, 1993; Davis et al., 1989; Venkatesh & Davis, 2000; Venkatesh & Morris, 2000). Thus, the purpose of the

present paper attempts to apply the TAM to explore the motivators and inhibitors of the knowledge sharing process involved in teacher training.

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, CITE was commissioned by the government to organise 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 organised 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 justifications 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 Centre for Information Technology in Education (CITE) of the University of Hong Kong. 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 the users to interact through synchronous or asynchronous communication. Built in features include announcement, resource, task, forum, calendar, chart, quiz, and evaluation. Instructors can customise 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 internalisation 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.

Procedure

The research model includes various constructs based on the 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 analyse the interaction logs in the web based platform in order to investigate the behavior in such an interaction.

This study investigates a training program organised 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 (Appendix) 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.

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.

Results

Summary of 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 are shown in Table 1. It shows that the number of read message was the most prominent participation indicating the knowledge sharing over the ILN was comparatively passive.

Table 1: Descriptive statistics of online activities

	Minimum	Maximum	Mean	Std. Deviation
Number of Login	0	14	5.50	3.528
Number of Read Message	0	229	59.38	57.912
Number of Post Message	0	12	3.36	3.077

The descriptive statistics of the measurement items are shown in Table 2. It shows that all the items show generally positive perceptions towards technology acceptance, 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 ($\alpha > 0.85$).

Table 2: Descriptive statistics and construct reliability

Items	Pre-training			Post-training		
	Mean	StdDev	Cronbach's alpha	Mean	StdDev	Cronbach's alpha
Perceived Usefulness (PU)						
PU1	5.14	1.10	0.96	5.24	0.98	0.95
PU2	4.86	1.19		5.15	1.02	
PU3	4.95	1.07		5.26	1.09	
PU4	4.96	1.15		5.08	1.06	
PU5	4.81	1.15		4.93	1.15	
PU6	5.00	1.15		5.14	1.05	
Perceived Ease of Use (PEOU)						
PEOU1	5.27	1.14	0.87	5.38	0.96	0.89
PEOU2	5.15	1.08		5.31	0.95	
PEOU3	5.27	0.91		5.22	1.05	
PEOU4	5.42	0.94		5.46	0.81	
PEOU5	5.66	0.86		5.47	0.92	
Intention to Use (ITU)						
ITU1	5.03	1.17	0.92	4.97	1.05	0.93
ITU2	4.85	1.18		4.72	1.24	
ITU3	5.08	1.25		4.96	1.09	
ITU4	5.08	1.11		5.05	1.01	
ITU5	4.89	1.26		4.78	1.17	

The factor components were then analysed 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 3). The components generated confirm the corresponding constructs as predicted by the TAM model.

Table 3: 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

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.

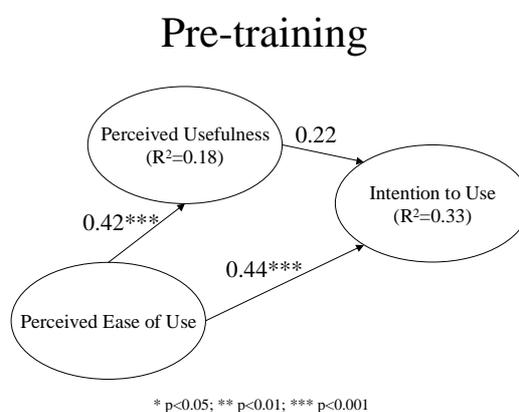
**Figure 1: Pre-training model**

Figure 1 and Figure 2 show 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 (Venkatesh & Davis, 2000; Hu et al., 1999; 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 (Table 4), it shows 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.

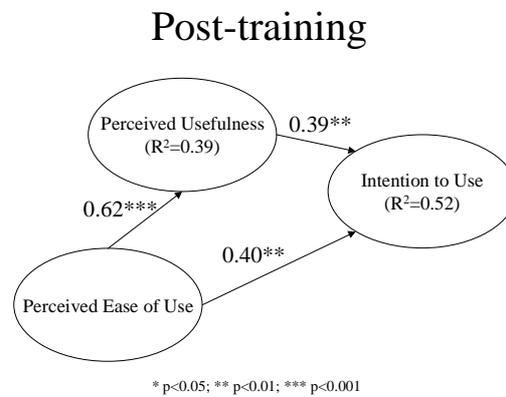


Figure 2: Post-training model

Table 4: Squared multiple correlations for structural equations (R-square)

Constructs	Pre-training	Post-training
PU	0.18	0.39
ITU	0.33	0.52

Table 5 summarises the path coefficients for each causal path in the models described in Figures 1 and Figure 2. 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.

Table 5: Individual causal path testing results

Causal Paths	Pre-training	Post-training
PEOU → PU	0.42***	0.62***
PEOU → ITU	0.44***	0.40**
PU → ITU	0.22 (ns)	0.39**

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

Technology acceptance and knowledge sharing

The correlation between technology acceptance and participation of knowledge sharing is shown in Table 6, in which knowledge sharing is defined as number of login, number of read message (receiving), and number of post message (giving) (Fullan, 2002). Obviously, inter-correlations were found among login, read, and post as well as PU, PEOU, and ITU in both pre-training and post-training. It was found that only intention to use was positively correlated to the number of read message in the pre-training, however, in the post-training, it was found that perceived ease of use and intention to use were positively correlated to the number of read message.

Respondents are classified into three groups, as high, medium and low in their total score on Intention to Use (ITU), in which five items in total, each is measured with seven point Likert scale (Table 7).

One way ANOVA was employed to determine the mean differences between the different ITU groups. Using the groups described in Table 7 as factors to find the dependent variables of the online participation activity, results show (Table 8) that there are significant differences in between the groups in two variables: number of login (F=3.712, p<0.05) and read message (F=5.842, p<0.01). Post hoc tests

indicated the high intention to use group is significantly higher than other groups in terms of number of login and read message.

Table 6: Corrections between technology acceptance and knowledge sharing

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

Table 7: ITU Groups in post-training

Intention to Use	Levels	Score	Number of respondents in that group
ITU	High	28-32	23 (31.1%)
	Medium	23-27	28 (37.8%)
	Low	10-22	23 (31.1%)

Table 8: One way ANOVA of post-training ITU to number of login and read message

Activity	ITU Level	Number of respondents	Mean	S.D.	F	Sig.
Number of Login	Low	23	5.00	3.384	3.712*	0.029
	Medium	28	4.61	3.143		
	High	23	7.09	3.716		
Read Message	Low	23	43.22	40.928	5.842**	0.004
	Medium	28	46.25	57.828		
	High	23	91.52	61.455		

*p<0.05; **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 small scale study gives us some 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 acceptance of the users as well as staff in the training organisation is considered as a major challenge to the development of e-learning within the organisation.

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 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 and to foster knowledge sharing in a learning community.

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 case 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; Bhattacharjee, 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. Therefore, the challenge is to reinvent teacher professional development in fostering knowledge sharing within and across schools (Fullan, 2002).

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Appendix: Questionnaire items

PU1	Using ILN improves my study of the Training course performance.
PU2	ILN enables me to accomplish my study of the Training course's tasks more quickly.
PU3	Using ILN enhances my effectiveness on the study of the Training course.
PU4	Using ILN increases my productivity in the study of the Training course.
PU5	Using ILN makes it easier to do the stuff of my study of the Training course.
PU6	Overall, I find ILN useful in my study of the Training course.
PEOU1	Learning to operate ILN is easy for me.
PEOU2	It is easy for me to become skillful in using ILN.
PEOU3	ILN is flexible to interact with.
PEOU4	I find it easy to get ILN to do what I want it to do.
PEOU5	My interaction with ILN is clear and understandable.
ITU1	I intend to use ILN when it becomes available in my school and at home.
ITU2	I intend to use ILN in my study as often as possible.
ITU3	I intend to use ILN in my study routinely.
ITU4	Whenever possible, I intend to use ILN in my study.
ITU5	To the extent possible, I would use ILN to do different things, for learning or for leisure.

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