Full Length Research Paper

Factors affecting the intention to use Facebook to support problem-based learning among employees in a Taiwanese manufacturing company

Shu-Ching Yang[1] and Chin-Hung Lin[2]*

[1]Department of Accounting Information at Aletheia University, Taiwan.
[2]Department of Information Management at Chung Chou University of Science and Technology, Taiwan.

This study offers an approach for understanding factors influencing employees' acceptance and usage of Facebook as an assisted learning tool in Problem-based Learning (PBL). Based on the Technology Acceptance Model (TAM), the objectives of this study are to explore behavioral intention and the factors (perceived usefulness (PU), perceived ease of use (PEU), social influence (SI), perceived enjoyment (PE), concentration (C) and computer self-efficacy (CSE) affecting Facebook use for assisted PBL. A survey was distributed to 377 employees in a Taiwanese manufacturing company. Among the factors explored, perceived ease of use (PEU) is a stronger predictor of user influence compared to others. The study concludes with implications for researchers, educators and policy makers who are interested in using social software to support learning.

Key words: Facebook, technology acceptance model, problem-based learning, social influence, employees in a Taiwanese manufacturing company.

INTRODUCTION

Traditional training methods can not satisfy the demand for personal development (Little, 2001). In order to enable employees to upgrade their skills and improve perfor-mances, employees have to be able to access the training (Wagner and Flannery, 2004). In recent years, a meteoric rise in social software users has led to numerous opportunities for users to use social software for recreational purposes. According to Dawson (2008), Internet users visit social software sites for longer periods of time than other websites. He recommends that edu-cators pay attention to recognition or rejection of social software, as it may simultaneously increase opportunities

for learning. Social software supported learning is an approach that allows employees to access training environment. The idea of "anytime, anywhere learning" improves employees lifelong learning and makes dis-tance become a past problem (Hamid, 2002). This also help the organizations in reducing the cost of training and increasing the training availability (Chiu and Wang, 2008).In PBL environments, one team of four to six students works together during the entire graining period to solve problems and apply concepts learned through individual assignments. In this study, we used social software-assisted PBL to extend team interactions online and outside of the physical classroom. Through commu-nication, employees learn from other employees and construct meaningful knowledge with the help of sharable social software. Google groups and Facebook groups are examples of such software. This paper uses a structural model to demonstrate factors affecting acceptance to those using Facebook-supported PBL. The purpose of this paper is to show how various factors intertwine to affect Taiwanese employees' decisions and behavioral intention to use Facebook-supported PBL by applying the expanded TAM. This study makes a contribution to

*Corresponding author. E-mail: chlin@dragon.ccut.edu.tw Tel: +886-4-831149 ext. 3018.

research in this content area. By examining the effect of TAM factors on Facebook-supported PBL of employees, the results of this study have implications for those interested in using social software to support employees' training activities.

Problem-based Learning (PBL)

PBL is an instructional strategy for organized team activities. Professional education and training activities have been adopted from PBL in the last 10 years (McPhee, 2002; Stokes, 2001). The conclusion is that employees acquire "knowledge and skills through a staged sequence of problems presented in context" (Boud and Feletti, 1991). Technology-supported PBL can be used to enrich interactions between employees and reduce the time constraints of the traditional training room, which is limited to interaction two hours per week. Larkin-Hein (2001) indicated that learners play an active role in the learning process through online discussion. In this study, employees are encouraged to participate in such online discussions. Using technology -supported PBL holds potential benefit for employees and instructors. Employees can use Information Communication Technology (ICT) as a communication and productivity tool (Jermann et al., 2004). In addition, instructors can use ICT to monitor and track the PBL learning process (Chan and Van Aalst, 2004). Integrating the strengths of various communication tools such as email and instant messaging to a shared workspace, such as Facebook, is an effective way to facilitate PBL. For instance, it is very difficult for people from different places to find a space or the free time to meet face-to-face (Larsen et al., 2008). Learning is a highly interactive process. Keeping track of what learners have accomplished in the learning process in an organized and efficient way is a critical issue to explore (Chan and Van Aalst, 2004). It helps employees to identify what tasks have been completed, and what else needs to be done in order to complete the learning process successfully. Using social software allows employees to share information, negotiate ideas and work cooperatively. Notably, the learning process can be automatically recorded by instructor. Using social software as a tool to assist learning is attractive and interesting to young users as well. It provides an opportunity to acquire knowledge, supporting project-based learning and allows for smoother learning processes (Larsen et al., 2008).

LITERATURE REVIEW

Model development and hypotheses

Assuming that choice is voluntary, people adopt Facebook (or any other technology) because they believe it will be useful in improving their efficiency and effectiveness when performing tasks (Venkatesh et al., 2003). Pedersen and Ling (2003) point out that the traditional behavioral intention models in information systems research may be modified and extended when they are applied to the study of adoption of Internet services. This study uses behavioral intention in Facebook supported PBL as a dependent variable. PU, PEU, SI, CSE, PE and C are six observed variables used to define the beha-vioral intention system (dependent variable). Subjects developed using Facebook are based on literature review of technology acceptance and theories. The research model in this study is shown in Figure 1.

Perceived usefulness (PU)

PU is the extent to which an individual believes that using an information system will enhance his or her productivity (Davis, 1989). Moon and Kim (2001) stated that PU is the extent to which an individual perceives attentions which are related to the interaction within the information system. Empirical studies by Venkatesh and Davis (2000) concluded that there is a causal relationship between PU and Peu. PU is a major determinant of behavioral intention to use (Davis, 1989). Several prior studies confirm the effect of PU on behavioral intention to use (Chang and Tung, 2008; Gallego et al., 2008; Pituch and Lee, 2006). PU may be a critical predictor of behavioral intention in using Facebook to support PBL. Therefore, the hypothesis is as follows:

H_1: PU has a positive influence on behavioral intention to use Facebook-supported PBL.

Perceive ease of use (PEU)

PEU of technology is the extent to which an individual perceives the use of an information system to be free of effort (Davis, 1989). The TAM indicates that PEU is a predictor of PU (Davis, 1989). In this context, Venkatesh and Davis (2000) revealed the relationship between PEU and PU since the easier the system is to use the more useful it is perceived to be. Many studies have confirmed the effect of PEU on PU (Gallego et al., 2008; Lee and Lee, 2006; Lee et al., 2007). Several research studies also confirmed the effect of PEU on behavioral intention (Al-So-mali et al., 2009; Chang and Wang, 2008). PEU may be a predictor for PU and behavioral intention in using Facebook to support PBL. Therefore, the hypothesis is as follows:

H_2: PEU has a positive influence on per-ceived usefulness.
H_3: PEU has a positive influence on behavioral intention to use Facebook-supported PBL.
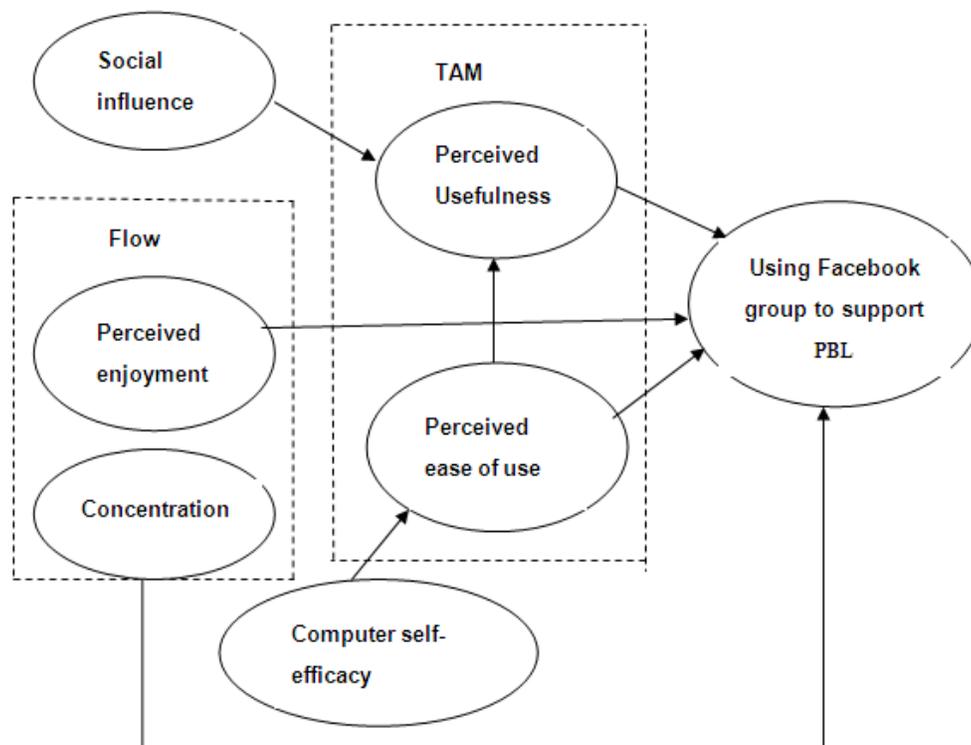
Figure 1. Research model.

Perceived enjoyment

Most TAM research proposes an extrinsic-motivation perspective and cannot fully reflect motives of e-learners Research in intrinsic motivational factors is required (Martinez-Torres et al., 2008; Ong et al., 2004). Flow is one of the positive psychological concepts related to intrinsic motivational factors. Flow theory includes PE, concentration and perceived control. PE is defined as "the extent to which the activity of using a specific system is perceived to be enjoyable in its own right, aside from any performance consequences resulting from system use" (Venkatesh, 2000). Perceived enjoyment has been found to have a significant impact on users' acceptance (Davis et al., 1992; Koufaris, 2002; Van der Heijden, 2004). Users are intrinsically motivated to adopt techno-logy when using technology for enjoyment. Thus, it is expected that perceived enjoyment would influence inten-tion to use Facebook to support PBL. The hypothesis is shown as follow.

H_4: PE has a positive influence on behavioral intention to use Facebook-supported PBL.

Concentration (C)

Concentration is another critical factor of the flow theory.

It is very important to users to be able to concentrate on activities and then be in a "flow" stage (Koufaris, 2002). Users cannot be in a flow stage if they cannot focus on a limited field with concentration when they perform tasks. Using Facebook-supported PBL, the instructor posts tasks, comments and guidelines for assignments. Facebook includes many distractions such as games, discussion boards and photos to browse. Students might focus their attention on chatting or playing games when they use Facebook to support PBL. As a result, we expect concentration to positively influence employees' behavioral intention of using Facebook-supported PBL. It may follow that:

H_5: Concentration has a positive influence on behavioral intention to use Facebook-supported PBL.

Social influence (SI)

Vandenbosch and Huff (1997) pointed out that percep-tions of technology are socially constructed to some extent. Social influence (SI) is exerted when a person values others' belief that he or she should use a new information system (Venkatesh et al., 2003). Prior studies note that SI is a significant factor in an individual's intention to use new technology (Thompson et al., 1991; Venkatesh and Davis, 2000). SI may also affect beha-vioral intention to use through PU. Previous   research

demonstrated the significant influence of PU (Bhatti, 2007; Horst et al., 2007). Karahanna and Straub (1999) stated that PU is determined in the order of importance set by social influence, exerted by a superior's use of e-mail. Therefore, the hypothesis follows that:

H_6: SI has a positive influence on PU in Facebook-supported PBL.

Computer self-efficacy (CSE)

Compeau and Higgins (1995) defined CSE as personal judgment of one's capabilities to organize and execute computer actions to attain designated goals. Compeau and Higgins' research identified CSE as a significant predictor of computer learning achievement. Chau (2001) suggested that CSE may be an important factor influencing PU. CSE may influence an individual's PEU of technology (Gong et al., 2004). Individuals with a high level of CSE can easily address problems encountered while using this technology (Compeau and Higgins, 1995). Related literature indicated that CSE plays a critical role in relationship to PEU. (Agarwal et al., 2000; Chau, 2001; Hong et al., 2001; Luarn and Lin, 2005; Wang, 2008). Related literature also indicated that CSE has a significant positive influence on PEU. It is to be expected that the effect of CSE will positively influence learners' behavioral intention. Based on this, the following hypothesis is made:

H_7: CSE has a positive influence on PEU in Facebook-supported PBL.

METHODOLOGY

Sampling and data collection

One online questionnaire was designed and used for collecting data. There were seven constructs with 21 items in an online questionnaire. This research was conducted during the September-October 2010 in the period of eight weeks to employees in a Taiwanese manufacturing company. This training course was offered for two hours every Thursday over the course of 8 weeks. A total of approximately 377 employees from five courses offered that training period, were divided into 77 groups of about four to six employees each. At the start of the training course, teams were formed based on friendship and subject and these teams would work together for all team activities during the training period. Each team was required to present a final assignment, creating and using a Facebook group to support their PBL. Employees were fami-liarized with creating and maintaining a Facebook group during a class demonstration. In order to leave sufficient evidence of PBL, employees in each group were encouraged to use Facebook as a tool for cooperation whenever possible. Instructors visited groups online to monitor use and give encouragement or make comments. Employees could leave comments and reply to other employees' contributions.

Finally, groups presented their assignments and made final arguments. Figure 2 presents a visualization of the key aspects of PBL activities supported by Facebook. All employees' accounts remained open for six months after completion of the training course, after which time these accounts were closed to protect employees' privacy. One strategy used in this study was to make the group size relatively big in order to promote online interaction. According to Wang (2008) smaller groups communicate more easily using phone calls or face-to-face meetings rather than using online tools. In this study, the size of the group ranged from four to six members, as suggested by Moallem (2003). A previous study (Vass, 2002) indicated that friends usually work together more easily, as they do not need to negotiate rules or regulations. They also show a greater sense of intrinsic motivation and autonomy support (Ciani et al., 2008). The same strategy was used in this study.

Instruments

To ensure the content validity of the scales, the items selected must represent the concept about which generalizations are to be made. Therefore, validated items adopted from prior studies are used. Instrument development consisted of reviewing the literature in order to identify measures for each construct: PU and PEU-Davis, (1989); PE and concentration- Moon and Kim (2001); SI- Ajzen and Fishbein (1980); CSE-Compeau and Higgins (1995) and behavioral intention-Agarwal and Karahanna (2000). A seven-point Likert-type scale is used, ranging from (1) strongly disagree to (7) strongly agree to answer the questions in the 7 constructs.

DATA ANALYSIS AND RESULTS

Data was tested using AMO 7.0 and SPSS 15.0. The measurement model was tested for reliability and validity of each of the constructs using confirmatory factor analysis.

Measurement model

The measurement model contained seven constructs with 40 items: Behavioral intention to use (BI), PEU, PU SI, CSE, concentration and perceived enjoyment (PE). Some constructs needed to be revised after the initial analysis of the measurement model. Seven constructs with 21 items were retained for further analysis.

The test of the measurement model includes estimation of reliability, the convergent and discriminant validities examined by using confirmatory factor analysis (Tables 1 and 2). The value of Cronbach's alpha for total is .929. The value of Cronbach's alpha for each construct sur-passes 0.8 in Table 1. This is statistically acceptable. Construct reliability is assessed based on composite Convergent validity is the degree to which two or more items measure the same concept (Bagozzi and Philips, 1982). The convergent validity of measurement items was examined by applying t-values, factor loadings, composite reliability and average variance extracted (AVE).

All the t-value of the items were significantly greater than 1.96 (Bagozzi et al., 1991). All items surpass the recommended factor loading value of 0.70 (Hair et al.,
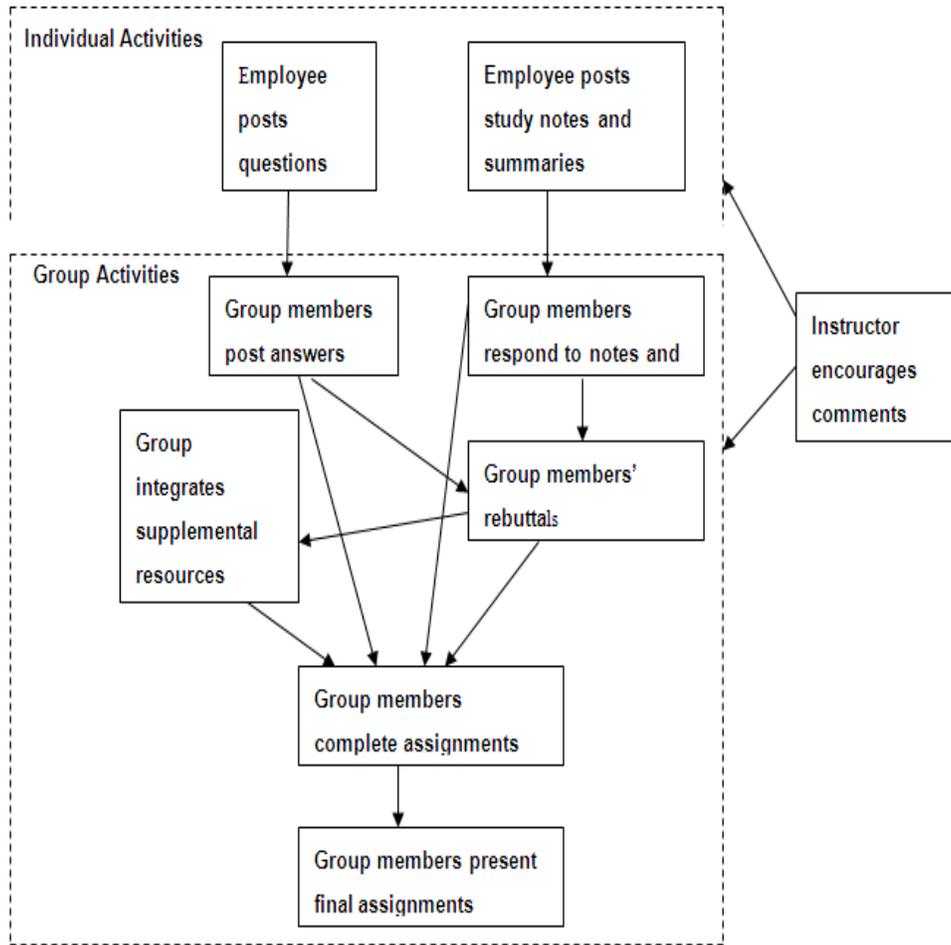
Figure 2. Facebook supports PBL activities.

1998). Composite reliability (CR) measures the internal consistency of observed variables in the measurement model (Nunnally and Bernstein, 1994). Moreover, all the composite reliabilities for each construct surpass the re-commended value of 0.60 (Diamantopoulos and Siguaw, 2000). All the AVEs surpass the recommended value of 0.50 (Fornell and Larcker, 1981). Thus, statistics in the Table 2 show that the convergent-validity requirement is satisfied. The average variance extracted is used to measure the discriminant validity of each construct. AVE is only acceptable when it is more than 0.5 (Fornell and Larcher, 1981). Discriminated validities are assessed by examining that the square root of the average variance extracted (AVE) by a construct (latent variable) from its indicators should be at least 0.7 (AVE > 0.5). Moreover, the square root of AVEs should be greater than that construct's correlation with other constructs, respectively (Fornell and Larcker, 1981). All constructs (latent varia-bles) satisfy these conditions: the square root of the AVEs is at least 0.7 and is much larger than all other cross-correlations for samples. Thus, the statistics show that

the discriminant-validity requirement is satisfied. (Data is shown in Table 2).

Structural model

The structural model shows the relationships between the constructs and specifies the constructs that are related to each other (Hair et al., 1998). The Table 3 shows that the fit indices are acceptable. The parameters determining the ratio of $\chi 2$ to degrees of freedom =1.483, GFI = 0.938, NFI =0.962, CFI = 0.987, AGFI=0.918, RMR=0.094, and RMSEA = 0.036, are all within the recommended values (Hair et al., 1998). This suggests that the model provides a reasonably good fit to the data. Figure 3 shows each construct in the model with the standardized path coefficients at significant levels. All the hypotheses were supported. The t-value of each con-struct reached a benchmark 2.58 (Table 4). The results of this study showed that PEU, PU, PE and C were signi-ficant predictors of behavioral intention to use Facebook

Table 1. Measurement model.

Dimension	Factor loadings	Composite reliability	AVE	t-value	Cronbach's alpha
Social influence					
SI1	0.769			17.009	
SI3	0.829	0.876	0.702	19.088	0.873
SI4	0.91			21.989	
Computer self-efficacy					
CSE2	0.78			17.602	
CSE4	0.923	0.899	0.749	22.935	0.897
CSE5	0.877			21.492	
Perceived ease of use					
PEU1	0.91			21.829	
PEU2	0.913	0.928	0.812	22.021	0.928
PEU3	0.88			20.748	
Perceived usefulness					
PU1	0.868			19.504	
PU2	0.888	0.907	0.766	19.978	0.908
PU3	0.869			19.277	
Perceived enjoyment					
E1	0.887			21.894	
E2	0.974	0.955	0.877	25.817	0.953
E4	0.946			24.443	
Concentration					
C1	0.888			21.518	
C3	0.91	0.920	0.793	22.343	0.920
C4	0.873			20.902	
Behavioral intention					
BI1	0.865			18.982	
BI3	0.851	0.891	0.732	18.845	0.894
BI4	0.851			18.917	

Table 2. Discriminant validity.

	SI	CSE	PEU	PU	PE	C	BI
SII	0.838*						
CSE	0.649(**)	0.865*					
PEU	0.299(**)	0.384(**)	0.901*				
PU	0.482(**)	0.375(**)	0.379(**)	0.875*			
E	0.537(**)	0.566(**)	0.307(**)	0.304(**)	0.936*		
C	0.344(**)	0.434(**)	0.381(**)	0.315(**)	0.293(**)	0.890*	
BI	0.462(**)	0.462(**)	0.426(**)	0.398(**)	0.375(**)	0.391(**)	0.856*

** Correlation is significant at the 0.01 level (2-tailed). *the square root of the AVEs.

Table 3. Statistics of model fit measures.

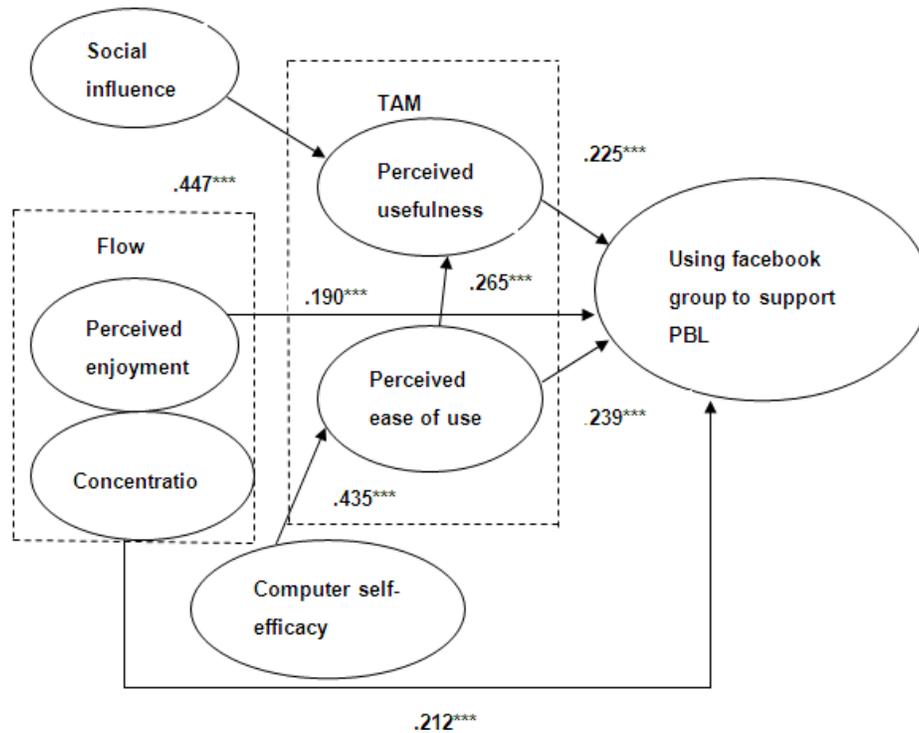| Model fit measure	Recommended value	Model value
χ^2 /d.f.	<3	1.483
GFI	>0.9	0.938
NFI	>0.9	0.962
CFI	>0.9	0.987
AGFI	>0.9	0.918
RMR	<0.1	0.094
RMSEA	<0.05	0.036

Figure 3. Path coefficients of the research model.

Table 4. Hypothesis and testing results.

Hypothesis	Path	Coefficient	t-value	Result
H$_1$	PU-BI	0.225***	3.931	Supported
H$_2$	PEU-PU	0.265***	4.991	Supported
H$_3$	PEU-BI	0.239***	4.153	Supported
H$_4$	PE-BI	0.190***	3.595	Supported
H$_5$	C-BI	0.212***	3.821	Supported
H$_6$	SI-PU	0.447***	7.682	Supported
H$_7$	CSE-PEU	0.435***	7.668	Supported

***$P<0.001$.

to support PBL. PEU is a much stronger predictor in all factors. Additionally, PEU has a positive influence on PU. CSE has a positive influence on PEU. Moreover, SI has a positive influence on PU.

DISCUSSION

Results of this study confirm that PU, PEU, SI, CSE and PE and C are significant factors in predicting the usage intention for Facebook-supported PBL among employees in a Taiwanese manufacturing company. There is suffi-cient evidence to confirm theories and assumptions that seven variables influenced the technology acceptance of employees in the manufacturing in Taiwan. Data in this study also indicated that the model is an adequate fit to the observed variables that influence employees' tech-nology acceptance. SI is found to be an antecedent of PU

of Facebook-supported PBL. This shows that opinions from both of peers and supervisors are very important to employees in a Taiwanese manufacturing company. Employees also enjoyed using Facebook to support PBL when a sociable environment was encouraged. The sociable environment included peers and supervisors. Additionally, peers and supervisors' opinions encourage employees to believe that technology is useful. Emplo-yees are motivated by use Facebook-supported PBL, if supervisors appreciate them for completing training through Facebook. Results support prior research findings (Bhatti, 2007; Horst et al., 2007; Karahanna and Straub, 1999) which note that SI is a determinant to PU. CSE is found to be an antecedent of PEU. It is very important to note that CSE has a significant influence on PEU. Instructors can increase employees' behavioral intention to use Facebook-supported PBL through CSE.

In order to increase employees' level of CSE, instructors may allow them access to the different types of technology they are most likely to use. This is to develop employees' CSE and is also related to prior experience of technology. Prior experience is the amount of time that user has engaged in technology usage (Paraskeva et al., 2008). This is consistent with previous research by Hasan (2003) that suggested that users should have in-course training of technology use in order to provide them with the skills and experiences that are related to further tasks. Employees will know how to use technology as part of the learning process and that in turn will optimize learning. The findings also support ease of use as a positive influence on using Facebook to support PBL. The other result of this study is PU as explained by PEU. By improving one's perception of ease of use of Facebook in PBL, PU can be enhanced. The results of this study also match the conclusion reached by Pituch and Lee (2006) that PEU has a positive effect on learners' PU of e-learning. The degree of ease of use and SI are both critical factors regarding usefulness of Facebook to support PBL. This study concludes that employees prefer a user-friendly platform to complete assignments throughout the PBL process. It follows that user-friendliness is an important factor in encouraging PBL among employees, particularly when aiming to optimize social software supported PBL. The results of this study demonstrate extrinsic and intrinsic motivations of users taking part in Facebook-supported PBL.

They are not only expecting a user-friendly and useful platform, but also want a flow experience. To support PBL in technology, employees require a powerful communication and entertainment platform. Facebook provides a rich entertainment-based platform for employees that can also be utilized to create and complete assignments (Koufaris, 2002). Enjoyment and flow experiences can be enhanced due to the general agreement of the usefulness of Facebook to support PBL. Results shows PE and C influence employees' behavioral intention to use Facebook assisted training. This coincides with research by Koufaris (2002) and Van der Heijden (2004) showing that learners not only want to communicate with others, but also try to have fun and obtain a flow experience at the same time. Concentration influenced employees' behavioral intention to use Facebook to support PBL. Employees with concentration adopt Facebook - supported PBL more readily than those who do not. Finally, instruc-tors have the ability to observe students' PBL activities by visiting the Facebook groups created, make comments and encourage those students who cannot concentrate on PBL tasks assigned.

Conclusion

Facebook has amassed millions of registered users in a relatively short time and has become part of users' daily lives. It also offers functions needed in an educational

tool used for PBL, such as the ability to write messages, share information and host discussion forums. Other beneficial functions include peer feedback, and interaction tools (Mason, 2006). With this study, we find that components of TAM (PEU and PU perceived), flow experience (PE and C), SI and CSE are important factors for using Facebook to support PBL. Based on the findings of this study, there are several approaches to using Facebook to support PBL. First, the findings of this study support development of social software with user-accepted systems. It also provides insight into social software's acceptance and its usefulness in supporting PBL. Secondly, the findings of this study indicate that PEU has the most significant influence on behavioral intention to use. Thus, user-friendly interface is the most important factor for employees in adoption of Facebook supported PBL.

Finally, in order to increase effectiveness of using Facebook to support PBL, it is important for instructors to consider not only extrinsic motivation (PU and PEU), but also intrinsic motivation (PE and C). This study has the following limitations: First, the sample used was composed of employees in the manufacturing in Taiwan. Surveying a different industry of employees (for example recreational industry) may produce different results. The findings and implications presented here were from a single study that included a specific leaner group in Taiwan. Caution is needed to avoid generalization of findings to other users groups or different industry. Social software integration with PBL is an ideal that proposes that educators and students alike should reflect on their teaching and learning practices. We urge educators to be aware of users' social environment, extrinsic and intrinsic motivations and gender differences in addition to their teaching activities. Another consideration would be the system features of the technology employed, in order to design and facilitate appropriate social teaching and learning experiences.

REFERENCES

Ajzen I, Fishbein M (1980). Understanding attitudes and predicting social behavior. Englewood Cliffs, NJ: Prentice-Hall.

Agarwal R, Karahanna E (2000). Time flies when you're having fun: cognitive absorption and beliefs about information technology usage. MIS. Q., 24(4): 665-694.

Agarwal R, Sambamurthy V, Stair RM (2000). Research report: The evolving relationship between general and specific computer self-efficacy-An empirical assessment. Inform. Syst. Res., 11(4): 418-430.

Al-So-mali SA, Gholami R, Clegg B (2009). An investigation into the acceptance of online banking in Saudi Arabia. Technovation, 29(2): 130-141.

Bagozzi RP, Philips LW (1982). Representing and testing organizational theories: A holistic construal. Adm. Sci. Q., 27(3): 459-489.

Bagozzi RP, Yi Y, Philips LW (1991). Assessing construct validity in organizational research. Adm. Sci. Q., 36, 421-458.

Bhatti T (2007). Exploring factors influencing the adoption of mobile commerce. J. Internet Bank. Commer., 12(3): 1-13.

Boud D, Feletti GI (1991). Introduction. In D. Boud, & G. Feletti (Eds.), The challenge of problem-based learning London: Kogan Page, pp. 13-20.

Chan C, VanAalst J (2004). Learning, assessment and collaboration in computer-supported environments. In J. W. Stribos, P. A. Kirschner, &

R. L. Martens (Eds.), What we know about CSCL Norwell, MA; Kluwer Academic Publishers, pp. 87-112.

Chang S, Tung F (2008). An empirical investigation of students 'behavioral intentions to use the online learning course websites. Br. J. Educ. Technol., 39(1): 71-83.

Chang HH, Wang IC (2008). An investigation of user communication behavior in computer mediated environments. Comput. Hum. Behav., 24(5): 2336-2356.

Chau PYK (2001). Influence of computer attitude and self-efficacy on IT usage behavior. J. End User Comput., 13(1): 23-33.

Chiu C, Wang ETG (2008). Understanding web-based learning continuance intention: The role of subjective task value. Inform. Manage., 25(3): 194-201.

Ciani KD, Summers JJ, Easter MA, Sheldon KM (2008). Collaborative learning and positive experiences: does letting students choose their own groups matter?. Educ. Psychol., 28(6): 627-641.

Compeau DR, Higgins CA (1995). Computer self-efficacy: Development of a measure and initial test. MIS Q., 19(2): 189-211.

Davis FD (1989). Perceived usefulness, Perceived ease of use and user acceptance technology. MIS. Qual., 13 (1): 319-339.

Davis FD, Bagozzi RP, Warshaw PR (1992). Extrinsic and intrinsic motivation to use computers in the workplace. J. Appl. Soc. Psychol., 22: 1111-1132.

Dawson, S. (2008). A study of the relationship between student social networks and sense of community. Educ. Technol. Soc., 141(3), 224-238.

Diamantopoulos A, Siguaw JA (2000). Introducing LISREL a guide for the uninitiated. London: Sage Publications Ltd.

Fornell,C, Larcker DF (1981). Evaluating structural equation models with unobservable variables and measurement error. J. Mark. Res., 18(1): 39-50.

Gallego MP, Luna P, Bueno S (2008). User acceptance model of open source software. Comput. Hum. Behav., 24(5): 2199-2216.

Gong M, Xu Y, Yu Y (2004). An enhanced technology acceptance model for web-based learning. J. Inform. Syst. Educ., 15(4): 365-374.

Hair JF, Anderson RE, Tatham RL, Black WC (1998). Multivariate data analysis with readings. Englewood Cliffs, NJ: Prentice-Hall.

Hamid AA (2002). E-learning-Is it the "e" or the learning that matters. Internet Higher Educ., 4(3): 311-316.

Hasan B (2003). The influence of specific computer experiences on computer self-efficacy beliefs. Comput. Hum. Behav., 19(4): 443-450.

Hong W, Thong JYL, Wong WM, Tam KY (2001). Determinants of user acceptance of digital libraries: An empirical examination of individual differences and system characteristics. J. Manage. Inform. Syst., 18(3): 97-124.

Horst M, Kuttschreuter MY, Gutteling JM (2007). Perceived usefulness, personal experiences, risk perception and trust as determinants of adoption of e-government services in The Netherlands. Comput. Hum. Behav., 23(4): 1838-1852.

Jermann P, Soller A, Lesgold A (2004). Computer software support for CSCI, in J. W. Strijbos, P. A. Kirschner R. I.L.Martens (Eds.), what we know about CSCI. Norwell, MA: Kluwer Academic Publishers, pp.141-166.

Karahanna E, Straub DW (1999). The psychological origins of PUand ease-of-use. Inform. Manage., 35(4): 237-250.

Koufaris M (2002). Applying the technology acceptance model and flow theory to online consumer behaviour. Inform. Syst. Res., 13(2): 205-223.

Larkin-Hein T (2001). Online discussions: A key to enhancing student motivation and understanding? In proceedings of 31st ASEE/IEEE frontiers in education conference Reno, NV, pp. F2G-6-F2G-12.

Larsen J, Urry, J, Axhausen K (2008). Coordinating face-to-face meetings in mobile network societies. Inform. Commun. Soc., 11(5): 640-508.

Lee KC, Kang I, Kim JS (2007). Exploring the user interface of negotiation support systems from the user acceptance perspective. Comput. Hum. Behav., 23(1): 220-239.

Lee Y, Lee J, Lee Z (2006). Social influence on technology acceptance behavior: Self identity theory perspective. Database Adv. Inform. Syst., 37(2-3): 60-75.

Little B (2001).Achieving high performance through e-learning. Ind. Commer. Train., 33(6): 203-207.

Luarn P, Lin HH (2005). Toward an understanding of the behavioral intention to use mobile banking. Comput. Hum. Behav., 21(6): 873-891.

Martinez-Torres MR, Marin, SLT, Garcia FB, Vazquez SG, Olivia MA, Torres T (2008). A technological acceptance of e learning tools used in practical and laboratory teaching according to the European higher education area. Behav. inform. Technol., 27(6): 495-505.

Mason R (2006). Learning technologies for adult continuing education. Stud. Cont. Educ., 28(2): 121-133.

McPhee AD (2002). Problem-based learning in initial teacher education: taking the agenda forward. J. Educ. Enquiry, 3(1): 60-78.

Moallem M (2003). An interactive online course: a collaborative design model. Educ. Technol. Res. Dev., 51(4): 85-103.

Moon J, Kim Y (2001). Extending the TAM for a world-wide web context. Inform. Manage., 38(4): 217-230.

Nunnally JC, Bernstein IH (1994). Psychometric theory. New York, NY: McGraw-Hill.

Ong CS, Lai JY, Wang YS (2004). Factors affecting engineers' acceptance of asynchronous e-learning systems in high-tech companies. Inform. Manage., 41(6): 795-804.

Paraskeva F, Buta H, Papagianna A (2008). Individual characteristics and computer self-efficacy in Secondary education teachers to integrate technology in educational practice. Comput. Educ., 50(3): 1084-1091.

Pedersen PE, Ling R (2003). Modifying adoption research for mobile internet service adoption: cross-disciplinary interactions. In Proceedings of the 36th Hawaii International conference on System Science (HICSS-36), Big Island, HI, Los Alamitos, CA: IEEE Computer Society Press. pp. 6-9.

Pituch KA, Lee Y (2006). The influence of system characteristics on e-learning use. Comput. Educ., 47(2): 222-244.

Stokes SF (2001). Problem-based learning in a Chinese context: faculty perceptions. In Watkins, D. A., & Biggs, J. B. (Eds.). Teaching the Chinese learner: psychological and pedagogical perspectives Hong Kong & Melbourne: Comparative Educational Research, pp. 201-218.

Thompson RL, Higgins CA, Howell JM (1991). Personal Computing: Toward a Conceptual Model of Utilization. MIS Q., 15(1): 125-143.

Vass E (2002). Friendship and collaborative creative writing in the primary classroom. J. Comput. Assisted Learn., 18(1): 102-110.

Vandenbosch B, Huff SL (1997). Searching and scanning: how executives obtain information from executive information systems. MIS Q., 21 (March): 81–108.

Van der Heijden H (2004). User acceptance of hedonic information system. MIS Q., 28(4): 695-704.

Venkatesh V, Davis, FD (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. Manage. Sci., 45(2): 186-204.

Venkatesh V (2000). Determinants of perceived ease of use: integrating control, intrinsic moti-social influence, and their role in technology acceptance and usage behavior. MIS Q., 24(1): 115-139

Venkatesh V, Morris MG, Davis GB, Davis FD (2003). User acceptance of information technology: toward a unified view. MIS Q., 27(3): 425-478.

Wagner GD, Flannery DD (2004). A quantitative study of factors affecting learner acceptance of a computer-based training support tool. J. Eur. Ind. Train., 28(5): 383-399.

Wang QY (2008). Student-facilitators' roles of moderating online discussion. Br. J. Educ. Technol., 39(5): 859-874.