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Gender differences in intention and relationship among factors of using Facebook for collaboration

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In Taiwan, in an effort to reduce the cost associated with educational training, enterprises have started to resolutely introduce the use of Facebook to support collaboration as part of employee training. Unlike previous studies investigating the effectiveness of conventional learning, the purpose of this paper was to discuss how various factors interconnect to affect Taiwanese employees' decisions regarding behavioral intention to use Facebook as support in collaborative learning situations. The expanded technology acceptance model (TAM) was applied. Employing structural equation modeling technology, the model was assessed using data collected from 385 participants by way of a survey questionnaire. Results show that social influence was the strongest factor influencing the use of Facebook to support collaboration and training adopting intention. Additionally, the findings also suggest that managers should anticipate that using Facebook to support collaboration in training may be perceived differently depending on the gender of the trainee, as we found that women are strongly influenced by co-workers and supervisors in these matters. Implications both in theory and practice are discussed, based on the findings.

Key words: Facebook, technology acceptance model, collaboration, gender.

INTRODUCTION

Technologies are rapidly changing the way organizations train their employees (Welsh et al., 2003). Organizations are increasingly attempting to use various media to support employee training, such as web-based or computer-based options. Dawson (2008) recommends that educators pay attention to trainee recognition or rejection of social software, as it may increase Opportunities for learning. Sigala (2007) indicates that the advent of social software presents opportunities for student-centered personalized learning environments. Through communication and collaboration, employees learn from one another and construct meaningful knowledge. One example of such a personalized learning environment could be Facebook, the web-based social networking tool, the use of which has been absorbed into the daily lives of many of its users, and has become a

pervasive web-based medium. Many of us are attached to it as a convenient channel for personal communication. As such, it has become necessary for organizations to review how the technology that is already available to their employees can be utilized to make communication and collaboration in the workplace more convenient and affordable than ever before.

One way of using Facebook to support collaborative learning would be to allow a group of employees to use an online discussion forum to share ideas, resources or materials. Using Facebook as a tool to assist in learning is a critical theme in this study and a review of prior studies provides a theoretical foundation for hypotheses formulation. Facebook is extremely popular and very highly rated for acceptance by individual users. Yet, despite this fast increase in Facebook usage, there is a lack of understanding regarding the factors driving Facebook collaboration adoption.

Numerous theoretical models have been proposed for understanding the factors impacting the acceptance of information technologies (Davis, 1989; Venkatesh and Davis, 2000). Based on these studies, the technology acceptance model (TAM) was found to be the most influential in explaining IT adoption behaviour. This paper focuses on employees' perception, by applying the TAM model to examine relationships that affect usage of Facebook to support collaboration.

A survey was conducted among employees in Taiwan to investigate learners' intention to use Facebook in collaboration specifically during their training period. In this study, an adoption model for the use of Facebook in supporting collaborative learning was proposed and then evaluated. Two additional factors were added to the TAM - social influence and flow. The next section offers a brief introduction to the use of social software in education, an overview of the development of Facebook and behavioral intention to use Facebook in collaboration.

RELATED RESEARCH

Social software and education

While social software can be used to facilitate learning, it mainly supports social activities and informal educational interaction between peers for sharing purposes (Gillet et al., 2008). Literature of social software shows some studies linked to collaboration and some in structural formatting such as uploading photos and writing comments. Boyd and Ellison (2007) defined social software as computer-mediated interaction that allow users to (1) construct a public or semi-public profile in a bounded system, (2) articulate a list of other users with whom they share a connection and (3) view and traverse their list of connections and those made by others in the system.

Users of social software are mostly young people with

some degree of interaction outside of the classroom. The lives of the Internet generation (those born after 1991) have obviously been affected tremendously by social software, shaping how they spend their time and also shaping their minds, enriching their knowledge, and conditioning their behavior (Gillet et al., 2008). Users still interact through more formal educational activities and by following and commenting on academic and social issues, dilemmas and disappointments faced while pursuing university education (Selwyn, 2007). Using social software as a tool to assist in learning is an attractive and interesting proposition to young users and should provide an additional opportunity to acquire knowledge, support project-based learning in higher education and smooth learning processes (Gillet et al., 2008).

Facebook

From a traditional education perspective, it is important to use education-based technology with underlying peda-gogical principles in mind. Care should be taken to create purposeful application of learning strategies (Mejias, 2005). In fact, members in the field of education are shifting their focus to examine technology that the traditional education system has been largely unable to develop further (Gillet et al., 2008).

Boyd and Ellison (2007) stated that social software developed first from Six Degrees.com in 1977 followed by Asian Avenue, Migent, MySpace, YouTube and Facebook. Facebook acquired millions of registered users in a short period of time. Facebook was launched in 2004 as Harvard-only social network and then expanded to include people world-wide who share similar interests (Cassidy, 2006). Facebook quickly evolved to become part of users' daily lives. Facebook has many collaborative functions such as peer feedback, and interaction tools that could be adapted for educational purposes (Mason, 2006).

Behavioral intention to use Facebook for collaboration

Facebook provides satisfactory tools for educational purposes such as message writing, information sharing platforms and discussion forums. Sigala (2007) stated that social software supported critical thinking, collaborative learning and communication through activities between partners who are working together. Users can use Facebook to promote connectivity, collaborative learning, knowledge acquisition and information exchange. In this way, users of Facebook are able to combine exiting material to share and use in partnership with others in a collaborative approach to knowledge acquisition.
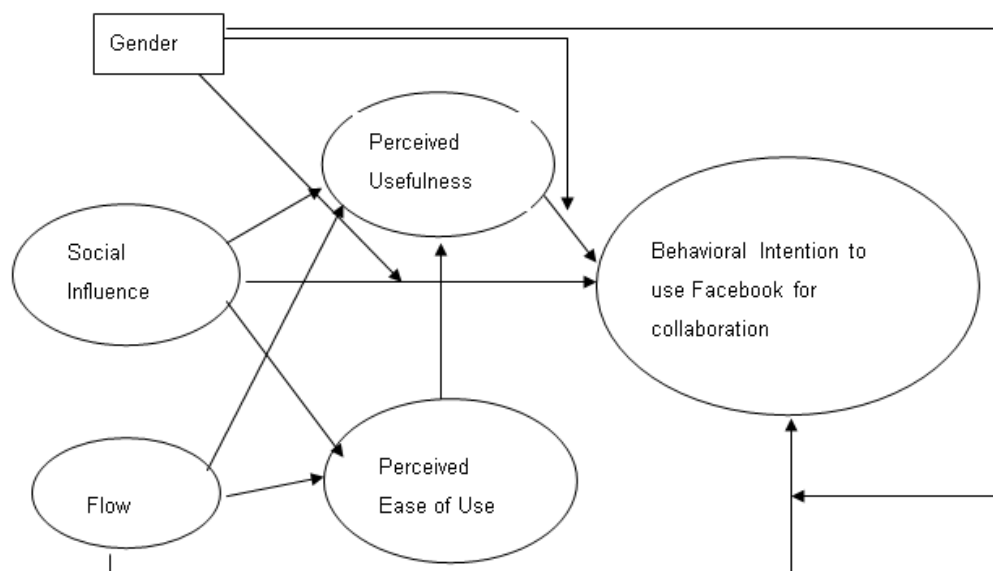
Figure 1. Research model

Theoretical framework and the research model

Technology acceptance model (TAM)

Technology acceptance is a popular stream of information system research (Hu et al., 1999; Venkatesh et al., 2003; Vessey et al., 2002). There have been several models explaining technology acceptance, particularly since the 1980s: Diffusion of innovation theory (Roger, 1995); social cognitive theory (Bandura, 1986) and the theory of reasoned action (Fishbein and Ajzen, 1975).The technology acceptance model (TAM) has received much attention. It has been used to predict users' behavior based on their attitude and intention. Particularly important user parameters are perceived usefulness and perceived ease of use (Dillon and Morris, 1996).

The TAM was adapted from the theory of reasoned action (Fishbein and Ajzen, 1975) and developed to examine technology adoption and users' behavioral intention in adoption of technology in the workplace. Research in this field has demonstrated that perceived usefulness and ease of use can be a significant predictor of user intention and behavior adoption regarding new technology (Hasan and Ahmed, 2007; Lee and Kim, 2009; Moon and Kim, 2001; Karahanna and Straub, 1999; Lu et al., 2009; Luarn and Lin, 2005).

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) pointed 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 used users' behavioral intention to adopt Facebook when collaborating as a dependent variable. The research model consists of five latent variables. Perceived usefulness, perceived ease of use, social influence, and flow are four variables used to explain the structure of behavioral intention (dependent variable). The subjects developed related to Facebook were based on the literature review of acceptance and supporting theories. The research model in this study is shown in Figure 1.

Perceived usefulness

Perceived usefulness is the extent that an individual believes that using an information system will enhance his or her productivity (Davis, 1989). Moon and Kim (2001) stated perceived usefulness is the extent that an individual perceives attention related to the interaction within the information system. Empirical studies by Venkatesh and Davis (2000) concluded that a causal relationship exists between perceived usefulness and perceived ease of use. These are two constructs of TAM that influence users' attitudes toward technology use and in turn affect behavioral intention to use technology (Cheung and Huang, 2005; Liaw et al., 2007).

Using Facebook for assistance in group learning situations can be considered to be a natural extension of computer use. Venkatesh and Morris (2000) indicated that men consider perceived usefulness to a greater extent than women in making their decisions concerning

usefulness and productivity-related factors in adopting new technology, and men are more driven by instrumental factors than women. Previous research (Ong et al., 2004; Venkatesh and Morris, 2000; Venkatesh et al., 2003) revealed that men consider perceived usefulness to a greater extent. This would suggest that an individual's intention to use Facebook to support group learning has an influence on his or her perceived usefulness of the system. We also expect that gender has an influence on perceived usefulness and behavioral intention to use Facebook for collaboration. Based on the above literature, we proposed the following hypotheses:

H1: Perceived usefulness positively affects intention to use Facebook for collaboration.
H2: Perceived usefulness influences intention to use Facebook collaboration more strongly for men than women.

Perceived ease of use

Perceived ease of use of technology is the extent that an individual perceives that using an information system is free of effort (Davis, 1989). Perceived ease of use and perceived usefulness are two variables affecting users' behavioral intentions in using technology. Venkatesh and Davis (2000) regarded the relationship between perceived ease of use and perceived usefulness as being equal, so the easier the system is to use, the more useful it is. Many studies have confirmed this effect of perceived ease of use on perceived usefulness (Gallego et al., 2008; Lee et al., 2007). Ong et al. (2006) found that men perceived more usefulness and ease of use in e-learning. Extensive research has further confirmed the effect of perceived ease of use to intention use (Al-Somali et al., 2009; Chang and Wang, 2008; Stoel and Lee, 2003). Therefore, we proposed the following hypotheses:

H3: Perceived ease of use positively affects perceived usefulness in using Facebook for collaboration.

Social influence

Vandenbosch and Huff (1997) pointed out that perceptions of technology are socially constructed to some extent. Social influence is exerted when a person values others' belief that he or she should adopt new technology (Venkatesh et al., 2003). Prior studies note that social influence is a significant factor in an individual's intention to use new technology (Thompson et al., 1991; Venkatesh and Davis, 2000). We expect that social influence is a significant determinant of behavioral intention in using Facebook to support collaborative learning. Prior researches (Bhatti, 2007; Horst et al., 2007) demonstrated the

significant influence on perceived usefulness. Karahanna and Straub (1999) stated that perceived usefulness is determined in the order of importance set by social influence, exerted by a supervisor's usage of e-mail. Furthermore, social influence of those using e-learning systems influenced behavioral intention to use e-learning more strongly in men than in women (Wang, 2008). A study by Venkatesh et al. (2003) showed that women have a stronger relationship between social influence and behavioral intention. Thus, we hypothesize as follows:

H4: Social influence positively affects intention to use Facebook for collaboration.
H5: Social influence positively affects perceived usefulness in using Facebook for collaboration.
H6: Social influence positively affects perceived ease of use in using Facebook for collaboration.
H7: Social influence influences intention to use Facebook for collaboration more strongly for women than men.

Flow and the theoretical model

Most of the TAM research proposes extrinsic-motivation perspective and cannot fully reflect what motivates e-learners. This requires research into intrinsic motivational factors (Martinez et al., 2008; Ong et al., 2004).

Flow is a positive psychological concept related to intrinsic motivational factors. Flow is defined as the holistic sensation that people feel when they act with total involvement (Csikszentmihalyi and Csikszentmihalyi, 1988). The flow concept is that when people are absorbed in an activity, their awareness is narrowed to the activity itself; they lose self-consciousness, and they feel in control of their environment (Csikszentmihalyi and Csikszentmihalyi, 1988). The concept of flow could also be a metric of online users' intrinsically enjoyable experience: "the extent to which the activity of using the computer is perceived to be enjoyable in its own right, apart from any performance consequences that may be anticipated" (Davis et al., 1992). In this way, using Facebook in collaborative learning situations could be defined as a form of enjoyment.

In web-based research using TAM model as theoretical background, Venkatesh (2000) found that there is a relationship between flow and perceived ease of use. Research by Agarwal and Karahanna (2000) shows perceived usefulness of the system is influenced by flow. Research in intention to use (Venkatesh, 2000) has explored how perceived intrinsic enjoyment has a strong relationship with TAM. Venkatesh et al. (2003) stated that men are strongly influenced by attitude summation of intrinsic cognitive beliefs similar to perceived enjoyment toward using the new technology and women are influenced by social norms and perceived behavioral control. Men are more sensitive to self-motivation or self-

satisfaction than women (Herring, 1999; Weatherall, 1998). Hwang and Kim (2007) concluded that men have greater perceived enjoyment than women in the context of flow theory. According to Koufaris (2002), flow includes perceived enjoyment, concentration, perceived control, and curiosity. Therefore, we expect flow will influence intention to use Facebook for collaborative learning more strongly in men than women. Based on the above research, we propose the following hypotheses:

H8: Flow positively affects intention to use Facebook for collaboration.
H9: Flow positively affects perceived usefulness in using Facebook for collaboration.
H10: Flow positively affects perceived ease of use in using Facebook for collaboration.
H11: Flow influences intention to use Facebook for collaboration more strongly for men than women.

METHOD

Participants

In this study, Facebook supported collaboration was implemented in an organization in Taiwan. This investigation used survey methodology and data were collected from a sample of online questionnaires filled out by employees who participated in a training program. A questionnaire was distributed to 385 participants. There was a fairly even distribution of gender (59.7% males and 40.3% females). Participants were asked to complete a questionnaire including demographic information.

Participants were required to do a group project using Facebook as a shared virtual workspace to support their collaboration. Participants in each group were encouraged work collaboratively as often as possible. Instructors would offer comments while visiting groups in order to check participation.

Measures

To ensure the content validity of the scales, the items selected must represent the concept about which generalizations can be made. Therefore, previously validated items adapted from prior studies were used. Instrument development included reviewing the literature in order to identify measures for each construct: perceived usefulness and perceived ease of use (Davis, 1989), Flow (Moon and Kim, 2001), social influence (Ajzen and Fishbein, 1980) and behavioral intention (Agarwal and Karahanna, 2000). A seven-point Likert-type scale ranging from strongly disagree (1) to strongly agree (7) was used to answer the questions about the five constructs.

Analysis

Structural equation modeling (SEM) is a statistical approach to examining the causal relationships and testing hypotheses between latent and latent variables in a research model (Hoyle, 1995). The main advantage of SEM is that it can estimate a measurement and structure model and achieve a good model fit after analysis and modification (Ngai et al., 2007). Boomsma (1987) stated that the smallest sample size should be higher than 200 if the maximum likelihood method is used to estimate the parameters. The sample size in this study is 385 and is sufficient. After data were collected from an online survey, they were tested using AMO 7.0 and SPSS 15.0. The measurement model was tested for reliability and validity of each construct using confirmatory factor analysis.

Measurement model

The measurement model contained five constructs with 25 items. Some constructs needed to be revised after the initial analysis of the measurement model. Five constructs with 17 items were retained for further analysis. The measurement model was evaluated in terms of reliability, the convergent and discriminant validities examined by using the confirmatory factor analysis (Table 1 and 2).

Reliability was examined using Cronbach's alpha values. Cronbach's alpha value for all items is .914. Cronbach's alpha value for each construct is greater than 0.8 in Table 1. These statistics are acceptable.

Convergent validity is to which degree two or more items measure the same concept (Bagozzi and Philips, 1982). The convergent validity of measurement item was evaluated in terms of the significance of t-statistics, factor loadings, composite reliability and average variance extracted (AVE). All the t-statistics of the items were significantly greater than the critical ration value of 1.96 (Bagozzi et al., 1991). All items except PEU4 are greater than the recommended factor loading value of 0.70 (Hair et al., 1998). Composite reliability (CR) measures the internal consistency of observed variables in the measurement model (Chen et al., 2004). Moreover, all the composite reliabilities for each construct are greater than the recommended value of 0.60 (Diamantopoulos and Siguaw, 2000). All the AVEs are greater than the recommended value of 0.5 (Fornell and Larcker, 1981). Thus, all these statistics in Table 1 indicate that the convergent-validity requirement is acceptable.

The average variance extracted is used to measure the discriminant validity of each construct. AVE is acceptable when it is greater than 0.5 (Fornell and Larcher, 1981). Discriminant validities are assessed by examining that the square root of the average variance extracted (AVE) by a construct (latent variable) from its indicators and should be at least 0.7 (AVE > 0.5). Table 2 shows the correlations among different constructs and the square root of the average variance extracted (AVE) on the diagonal. Moreover, the square root of AVEs on the diagonal should be greater than that construct's correlation with other constructs, respectively (Fornell and Larcker, 1981). All constructs (latent variables) satisfy these conditions: The square root of the AVEs is at least 0.7 and is much greater than all other cross-correlations for samples. Thus, we conclude these statistics show that the Discriminant-validity is acceptable. Data are shown in Table 2.

Structural model

Structural equation modeling was conducted with AMOS 7.0 to examine how the research model fit the data. The structural model shows the relationship between the constructs and specifies the constructs that are related to each other (Hair et al., 1998). Table 3 shows the fit indices are acceptable. The indications of a good fit are below. The ratio of χ^2 to degrees of freedom =1.027, GFI = 0.971, NFI =0.980, CFI = 0.999, AGFI=0.954, RMR=0.052, and RMSEA = 0.008. These statistics are all within the recommended values (Bentler, 1990; Hair et al., 1998). This suggests that the model provides a reasonably good fit to the data.

Table 1. Measurement model.

Dimensions	Factor loadings	Composite reliability	AVE	t-statistics	Cronbach Alpha
Social influence		**0.911**	**0.721**		**0.913**
SI1	0.766			17.446	
SI2	0.786			18.139	
SI3	0.911			22.910	
SI4	0.921			23.318	
Flow		0.893	0.807		0.869
F3	0.924			22.167	
F4	0.872			20.418	
F5	0.724			15.835	
Perceived ease of use		**0.881**	**0.662**		**0.884**
PEU1	0.905			22.002	
PEU2	0.915			22.492	
PEU3	0.878			21.099	
PEU4	0.469			8.563	
Perceived usefulness		**0.907**	**0.766**		**0.910**
PU1	0.875			20.688	
PU2	0.891			21.070	
PU3	0.870			20.103	
Behavioral Intention		**0.910**	**0.772**		**0.895**
BI1	0.874			19.496	
BI3	0.845			18.589	
BI4	0.858			19.351	

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

Table 2. Discriminant validity.

	SI	Flow	PEU	PU	BI
SI	0.849*				
Flow	.390(**)	0.898*			
PEU	.409(**)	.355(**)	0.813*		
PU	.388(**)	.353(**)	.413(**)	0.879*	
BI	.485(**)	.387(**)	.454(**)	.414(**)	0.860*

Table 3. Statistics of model fit measures.

Model fit measure	Recommended value	Model value
1. χ2 /d.f.	<3	1.027
2. GFI	>0.9	.971
3. NFI	>0.9	.980
4. CFI	>0.9	.999
5. AGFI	>0.9	.954
6. RMR	<0.1	.052
7. RMSEA	<0.05	.008

RESULTS

Figure 2 shows each construct of the model with the standardized path coefficients and respective significant levels. The results of this study showed that perceived usefulness, social influence and flow were found to be significant predictors of behavioral intention to use Facebook to support collaboration in training. Table 4 indicated that women = 0.518*** greater than men=0.370*** in predicting social influence in using Facebook supported collaboration. Social influence is a much stronger predictor in all factors. Additionally, summary of the testing results from Table 5 shows perceived ease of use has a positive influence on perceived usefulness. Social influence has a positive influence on perceived
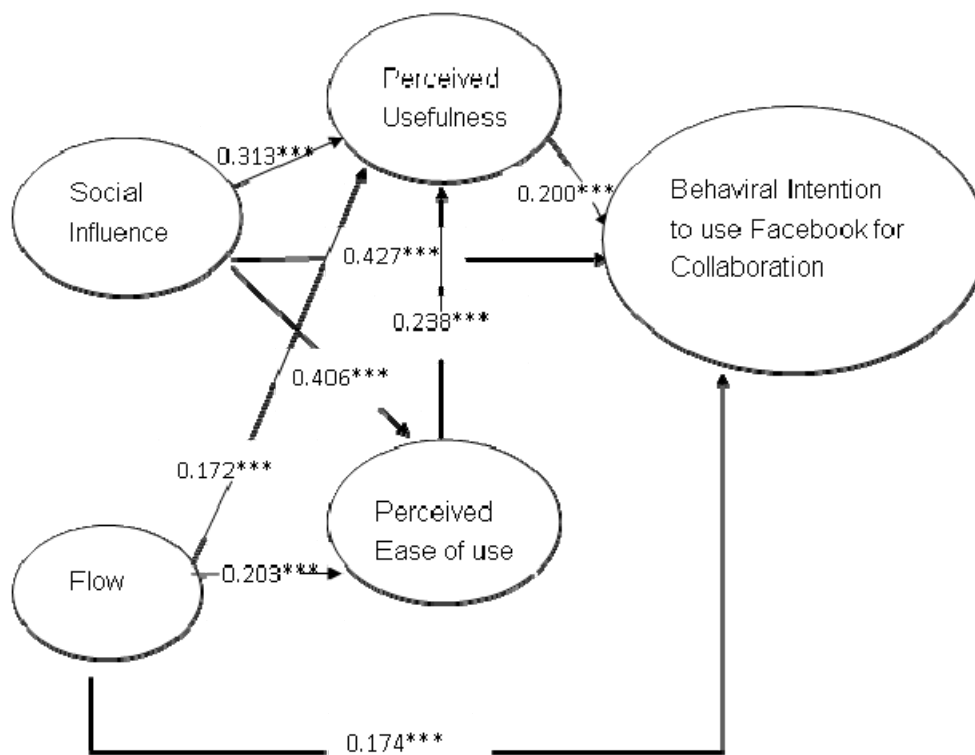
Figure 2. The research model's test results ***P<0.001.

Table 4. Gender differences in relationships of PU-BI, SI-BI and FLOW-BI.

	Entire sample	Men	Women
	β	βm	βw
PU-BI	0.200***	0.148	0.247
SI-BI	0.427***	0.370***	0.518***
FLOW-BI	0.174***	0.210***	0.095

***P<0.001.

Table 5. Summary of testing results.

	Relationship	Hypothesis	Result
Main effect			
H1	PU-BI	Positive	Supported
H3	PEU-PU	Positive	Supported
H4	SI-BI	Positive	Supported
H5	SI-PU	Positive	Supported
H6	SI-PEU	Positive	Supported
H8	FLOW-BI	Positive	Supported
H9	FLOW-PU	Positive	Supported
H10	FLOW-PEU	Positive	Supported
Gender			
H2	PU-BI	Men>Women	Not significant
H7	SI-BI	Women>Men	Supported
H11	FLOW-BI	Men>Women	Not significant

BI=behavioral intention; PU= perceived usefulness; PEU= perceived ease of use; SI= Social Influence.

ease of use and perceived usefulness. Flow has a positive influence on perceived ease of use and perceived usefulness.

IMPLICATION AND CONCLUSION

This study confirms the significance of TAM-research findings. Perceived usefulness and perceived ease of use are important variables affecting the acceptance of using Facebook for collaboration. This study also makes a contribution by extending the TAM model. Social influence is found to be the strongest determinant of use intention. This shows that workplace opinions are very important to

employees when adopting new technology. Employees believed that using Facebook can help complete job-related tasks and can support collaboration with co-

workers. Employees also enjoyed using Facebook to support collaborative learning when a sociable environment was encouraged (this sociable environment included peers and a supervisor.)

Karahanna and Straub (1999) indicated that supervisors may encourage employees to use technology to increase knowledge. The results of this study show employees value the opinions of a supervisor as important and serious. Social influence is a key element of success in using Facebook in training, as it promotes both perceived usefulness and perceived ease of use. Results pointed to the positive effect of gender differences and social influence on intention to use Facebook for collaboration. Note that women are affected more strongly by social influence on intention to use Facebook for collaboration.

The findings also support the positive effect that perceived usefulness has on adopting Facebook to support collaboration during training. The other result of this study is perceived usefulness as explained by perceived ease of use and social influence. The perceived usefulness of Facebook in collaboration can be enhanced by promoting perceptions about ease of use of Facebook during collaboration based on the opinions and beliefs of influential group members. This finding supported Karahanna and Straub (1999); Bhatti (2007) and Horst et al. (2007), in which perceived usefulness could be influenced by a supervisor's commitment. The results also match the conclusion of Pituch and Lee (2006) that perceived ease of use has a positive effect on perceived usefulness. Therefore, enhancing the degree of ease of use and social influence will be a critical factor in perceived usefulness of adopting Facebook to support collaboration. In order to increase effectiveness of Facebook supported collaboration, it is important for users to perceive that the technology is useful and will enhance their job performance or productivity.

The result of this study also demonstrates extrinsic and intrinsic motivations of employees using Facebook to support collaboration. They are not only expecting an easy to use and otherwise useful platform, but also want to experience enjoyment in the context of flow theory. To support collaboration in technology, employees required a powerful communication and entertainment platform. Facebook provided employees with a rich entertainment function while also supporting their workplace collaboration. Adoption is only a first step in using Facebook supported collaboration. It can be used successfully in training. However, there is still a need to investigate further.

This study made a contribution by examining the effect of TAM factors on Facebook supported collaboration and how it might be moderated by the gender of employees in Taiwan. The results of this study have implications for those interested in using social software to support training activities.

Limitation and further research

As with any research, this study has some limitations that should be considered. First, the findings and implications presented here were from a single study that included a specific group in Taiwan. Caution is needed to avoid generalization of findings to other user groups or different industries. Second, this study focused on using hedonic-oriented social software for an educational training situation. The results should not be applied to administration or communication situations. Further research could be conducted to investigate using Facebook to support collaboration between users from different cultural backgrounds or for different purposes.

Conflict of Interests

The authorshave not declared any conflict of interests.

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