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Learners' continuance participation intention of collaborative group project in virtual learning environment: an extended TAM perspective

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Abstract

The aim of this study is to explore learners' intention to return to the electronic environment through the use of wikipages. The survey is based on students' participation in a collaborative group project over a one semester course on business information systems. A research model based on the extended Technology Acceptance Model (TAM) has been proposed to investigate what factors will influence learners' continuance participation in the electronic learning environment. 75% of students returned the questionnaire and the data analysis results based on the extended TAM Shows that the learners' intention to return to the electronic learning environment was highly associated with their attitude towards the electronic learning tool and the affection associated with the tool.

Keywords Wikipage · Intention · Collaborative group project · Affection · Electronic learning environment · TAM

1 Introduction

The electronic learning concept has been gaining attention from education institutions ever since the emergence of the Internet. Universities are endeavouring to expose students to various web-based learning environments. In addition, various popular collaborative technologies such as online forums, wikipages, podcasts, and blogs have been implemented into virtual learning environments to facilitate lecturers' teaching as well as enhance learners' learning experience. The most common one would be the blackboard system where a series of studies have been conducted (Liaw, 2008, Bradford et al., 2007, Cilliers, 2017, Vine, 2015, Karplus, 2017). Other successful examples of electronic learning tools are reported for course web-page combined with student personal homepages

(Carver, 1999), building personal learning management systems (Chen et al., 2018), electronic learning forums (Brazelton and Gorry, 2003), wiki (Hill et al., 2006, Wang et al., 2005), online discussion board (Cheng et al., 2011), virtual communities for nursing students (Giddens et al., 2010a), and virtual worlds (Oliver and Carr, 2009). The purpose of electronic learning tools has also been extended outside the traditional classroom to professional development (Spitzer and Wedding, 1995, Brooks, 2010), organizational knowledge creation (Christian and Narasimha, 2005, Yates et al., 2010), customer relationship management (Pai and Tsai, 2011) and lifelong learning (Sandelands and Will 1996).

The benefits of electronic learning tools have been reported to vary from time-saving to collaborative learning (Roberts and Fox, 1998), increased participation from minority students (Giddens et al., 2010b), reinforced reflection during the learning process (Makoul et al., 2010), collective intelligence (Luo et al., 2009), and identity building (Kajee, 2008). However, the original theoretical foundation for electronic learning tools can be traced back to the experience theory brought out by Dewey (1938). According to Dewey (1938), experience is essentially important in the education process and online tools can provide a collaborative learning environment for students to gain the learning experience other tools might not provide. This perspective has also been supported by the modern social scientist Wenger (1998) who

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proposed that we learn in all kinds of community of practice and virtual communities are shaped by all kinds of technologies to provide space to accumulate practice of knowledge in the learning process.

Despite all the practical and theoretical benefits provided by virtual learning communities, there are many difficulties reported in implementing virtual learning tools. Among these one of the most essential ones is the learner's motivation to participate in the electronic learning process. For example, it has been reported by several researchers that learners might not come to participate even though the technology learning tools have been built and been made available to them (Brazelton and Gorry, 2003). Practically, it has also been found that only 1–10% of active participants in the virtual communities (Preece et al., 2004). Given the factor that the degree of participation is highly related to the performance of the learning outcomes (Stefan, 2008, Giddens et al., 2010b) and the more a learner participates in virtual communities, the higher the performance associated with his or her assignment related outcomes, it is essential to increase the learner's participation during the electronic learning implementation process.

Several previous studies have investigated the motivations for electronic learning participation, such as face-to-face meeting (Brazelton and Gorry, 2003) and class forum (Limayem and Hirt, 2003). However, few studies (Lee, 2010) tried to investigate whether learners would like to return to use the virtual learning technologies. One important question would be, what factors influence the learner's intention to return to the electronic learning environment after their current participation? The aim of this study is to explore the learners' intention to return to the electronic environment through the use of Wikis. This study is of significant importance to many institutions adopting blackboard system. Technology Acceptance Model (TAM) (Davis, 1989, Davis et al., 1989a, Davis et al., 1989b) was proposed to investigate what factors will influence learners' continuance motivation to participate in the electronic learning environment. The study investigates both the lecturer's perspective and students' perceptions on the participation process. The survey is based on students' participation in a collaborative group project over a one semester course on business information systems. 75% of students returned the questionnaire and the data analysis results based on the extended Technology Acceptance Model (TAM) shows that the learners' intention to return to the electronic learning environment was highly associated with their attitude towards the electronic learning tool and the affection associated with the tool.

2 Literature review

Behavioral intention is regarded as the most important factor leading to actual behavior in the classical behavioral theories

such as Theory of Reasoned Action (TRA) (Fishbein and Ajzen, 1975), Theory of Planned Behavior (TPB) (Ajzen, 1991) and Triandis Model (Triandis, 1980). Behavioral intention's effect in predicting actual behavioral has also been verified by the established IS adoption model—Technology Acceptance Model (TAM) in various contexts such as e-banking (Lai and Li 2005), ERP (Amoako-Gyampah and Salam, 2004), Virtual Worlds (Fetscherin and Lattemann, 2008), virtual community recommendation system (Lee et al., 2007), and online shopping (Vijayarathay, 2004a), to name a few.

In the same line of research, among past literature on virtual participation behavior in the electronic learning environment, intention has been identified as the most salient antecedent leading to direct participation behavior. For example, intention could explain around 70% of variance for the behavior to adopt the information technology (Venkatesh et al., 2003). We thus use intention as the major variable to measure students' possibility for the future participation in the virtual learning environment. This section briefly reviews the past literature on factors influencing students' intention to participate in electronic environment.

Although many studies have reported the effects of electronic learning on students' performance, especially the exam performance, the literature focusing on the motivations to participate in virtual learning environment are sparse. According to several studies, students' experiences are enhanced through participating in the virtual learning environment because they have a learning context beyond the traditional class room. For example, it is reported that students' practices in journalism have been improved because of the Wikipedia participation (Ma and Yue, 2008). At the same time, it has also been reported that nursing students' understanding of the patients' conditions are improved by participating in the virtual learning community Neighborhood (Giddens et al., 2010b). Not many articles investigate the students' motivation to participate in the learning environment except several case studies and empirical paper. For instance, in the case study of the Wikipedia usage in the learning environment, the findings indicate that the extent of training provision, the wiki pedagogy, and participants' readiness for and awareness of their roles in a collaborative online learning environment are major factors affecting the effective usage of the wiki (Choy and Ng 2007). In another research, Ma and Yue (2008) reported that students enjoy the social interaction during the Wikipedia participation process.

In the sparse number of studies on students' motivation to participate in the e-learning environment, the Technology Acceptance Model (TAM) was adopted quite often. TAM was firstly brought out by Davis to investigate users' acceptance of information technology in the workplace and was further revised and developed to explain users' technology adoption behaviour specifically from the information systems

perspective (Davis, 1989, Davis et al., 1989a, Davis et al., 1989b, Venkatesh and Davis 1996, Venkatesh et al., 2003). Before TAM, the technology adoption behaviour has been explained by referring to theories from social psychology, e.g., TRA (Fishbein and Ajzen, 1975), TPB (Ajzen, 1991), and Triandis (Triandis, 1980). TAM proposed that the individual technology adoption is decided mainly by his or her behavioural intention of using the technology. The behavioural intention is influenced by attitude toward the technology, which is influenced only by two variables—perceived usefulness and perceived ease of use of the technology. Despite TAM has received some criticism for its over parsimony (Bagozzi, 2007), it is a powerful theory to explain the technology adoption behaviour in many scenarios including online banking (Lai and Li 2005), physician's adoption of information technology (Hu et al., 1999), ERP adoption (Amoako-Gyampah and Salam, 2004), online shopping acceptance (Vijayarath, 2004a), to name a few.

In the online learning environment, TAM has also been used as a theoretical model to explain learner's behaviour. For example, in their study on dentist students' acceptance of e-learning technology in South Korea, Byoung-Chan et al. (2009) found that TAM applies to the situation and several variables are effective in influencing perceived usefulness and perceived ease of use including playfulness, instructor characteristics, teaching material, and design of the learning content. In another study, Lee (2010) reported that perceived enjoyment, perceived usefulness and satisfaction are key variables in influencing students' participation in a virtual learning environment. In examination of students' intention to use an e-portfolio system, it was reported that perceived ease of use is the most effective variable and perceived ease of use has the strongest effect on intention (Shroff et al., 2011). Similarly, Alenezi et al. (2010) investigated students' intention to participate in the electronic learning systems with TAM and found that computer anxiety, computer self-efficacy and enjoyment significantly influence the students' intention to use E-learning systems. The TAM effect was further verified by students' acceptance of WebCT with the effect of flow on intention to participate (Sanchez-Franco, 2010).

Social and emotional variables are identified as an important line of research to investigate in recent electronic learning acceptance systems. In Sanchez-Franco et al.'s (2009) study on culture difference of electronic learning systems acceptance, it has been found that culture has a significant effect on students' technology acceptance. In another study, Roca and Gagne (2008) investigated continuance intention to accept e-learning systems in the workplace and found that self-determination theory could explain employees' intention to participate. Several variables are found to significantly influence E-learning continuance intention including perceived ease of use, perceived usefulness, perceived playfulness, and perceived self-autonomy.

In all the previous studies, only three studies have investigated the students' intention to return to use the electronic learning environment (Roca and Gagne, 2008, Lee, 2010, Roca et al., 2006). Since intention to return is an important variable determining students' continuing usage of electronic learning environment in future learning activities, it is important to study it from different perspectives.

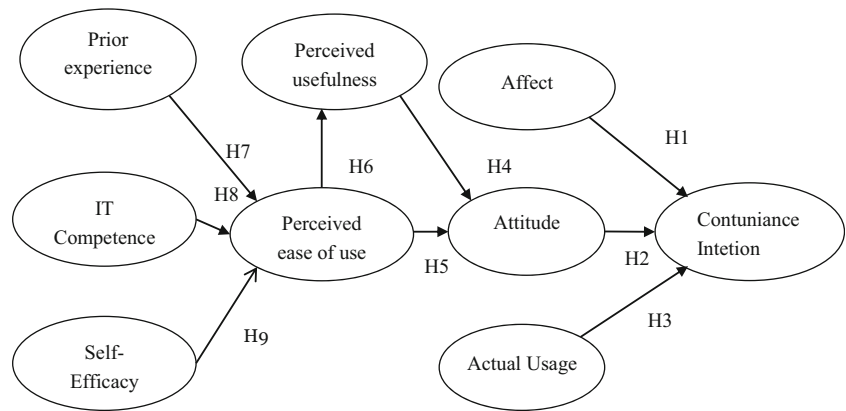
3 Research model & hypotheses

This paper investigates what factors influence the students' continuance intention to use the electronic environment after the initial usage. The TAM model was applied to the study because it is the most established technology adoption model and has been widely adopted to predict many types of technologies including educational technologies (Lee, 2010). Previous studies have reported that TAM is more effective when context related variables are considered, for example, when applied in a Saudi Arabian environment, enjoyment, computer anxiety, self-efficacy are more important (Alenezi et al., 2010). In applying to the Korean environment, flow constructs are added to the TAM model (Lee et al., 2009). While applying to internet usage, information needs perspective was added into the model (Shih, 2004). Following previous study and out elicited questions from learners in the first stage of research model construction, to adapt the TAM model into the research context, especially for the intention to return, several constructs are added into the model as shown in Fig. 1. Other than attitude toward electronic environment, both affect and actual usage are proposed to influence the students' intention to return to use the electronic learning environment. As affect has been reported to either be associated with or influence intention in several other research models, for example Triandis model (Triandis, 1980), affect has been included in this research model. As students come from different backgrounds and vary in their perceptions about technology, another three variables, prior experience, IT competence, and self-efficacy, were added to determine what will influence perceived ease of use. Perceived ease of use has been reported to be a key variable during the initial implementation stage (Alenezi et al., 2010, Fenech, 1998, Shroff et al., 2011, Igbaria and Iivari, 1995, Chiasson and Lovato, 2001, Mawhinney and Lederer, 1990, Sánchez-Franco and Roldán, 2005).

3.1 Antecedents of continuance intention

While behavioural intention has been widely studied for the information technology adoption, the continuance intention to use the information technology is firstly brought out by Bhattacharjee (2001) to refer to users' continuous usage of the information technology after the initial adoption decision. It is not until 2007 that the concept is widely studied from

Fig. 1 Research model



different adoption context. For instance, the continuance intention toward e-learning is studied from TPB and expectation-confirmation perspective (Lee, 2010). In another study, the continuance intention toward e-learning is studied from the extended TAM perspective as well (Roca et al., 2006). Roca and Gagne (2008) has also studied the continuance intention toward e-learning with the self-determination theory. In all the previous studies, continuance intention is normally influenced by attitude except Roca et al. (2006) has used satisfaction as the antecedents of intention. In other studies, continuance intention is also influenced by attitude (Lin, 2011). Based on the previous study, we have the following hypothesis 1.

H1: Students' attitudes toward e-learning environment will positively influence students' continuance intention to use e-learning environment in the future.

Following the previous discussion on the antecedents of continuance intention, emotional and social factors are identified as important in students' repetitive participation (Alenezi et al., 2010). Here we represent emotional factors with Affect, a construct from Triandis Model (Li and Lee, 2013, Triandis, 1980). We proposed the following hypothesis 2:

H2: Students' affect toward e-learning environment will positively influence students' continuance intention to use e-learning environment in the future.

The actual usage was regarded to influence the future technology usage, i.e., continuance intention to use the technology in many early stage of studies (Kim and Malhotra, 2005). Late it has evolved into a new concept—confirmation in several other continuance intention studies (Bhattacharjee, 2001, Oghuma et al., 2016). It has also been an important factor identified in our stage one data elicitation results from students as described in the research methodology section. We thus proposed the following hypothesis 3:

H3: Students' current actual usage of e-learning environment will positively influence students' continuance intention to use e-learning environment in the future.

3.2 Antecedents of attitude

As in the original TAM model, the antecedents of attitude is perceived usefulness and perceived ease of use (Davis, 1989, Davis et al., 1989a). Perceived usefulness and perceived ease of use's effect on attitude has been tested and validated in many previous studies under various contexts (Teo, 2011, Vijayasarathy, 2004b). In the wikipedia environment, students' perception of usefulness and ease of use will influence their attitude toward the use, we thus proposed that:

H4: Students' perceived usefulness toward e-learning environment will positively influence students' attitude toward e-learning environment.

H5: Students' perceived ease of use toward e-learning environment will positively influence students' attitude toward e-learning environment.

3.3 Perceived Usefulness and Perceived Ease of Use

The perceived ease of use and perceived usefulness relationship is proposed in the original TAM model and the rationale is that the easier a user perceived the system to use, the more useful he or she will perceive the system to be useful. Despite the relationship is not salient in certain contexts, the relationship has been validated in many contexts, especially in the educational context (Karahanna and Straub, 1999, Saade and Bahli, 2005, Doll et al., 1998, Lai and Li 2005, Shroff et al., 2011). In the wikipedia usage context, we would assume that the easier the system to be used, students would think it's useful to use the wikipedia for the collaborative assignment. We thus proposed:

H6: Students' perceive ease of use toward e-learning environment will positively influence students' perceived usefulness toward e-learning environment.

3.4 Antecedents of perceived ease of use

Perceived ease of use is considered to be an important factor to influence students' attitude toward wiki page usage in the initial stage of data elicitation from students. From the past literature, it has been reported that the perceived ease of use is influenced by prior experience of technology (Taylor and Todd, 1995, Ford et al., 2001, Hackbarth et al., 2003). It has been found that the prior experience can reduce anxiety and increase the sense playfulness of using technology, which thus increase students' perceived ease use of the system (Hackbarth et al., 2003). A similar concept of IT competence refers to a users' capability to use the technology in general and not specific to the technology in use, will increase the perceived ease use of the system (Mawhinney and Lederer, 1990, Munro et al., 1997, Bassellier et al., 2001). And the self-efficacy refers to a users' confidence with the information technology in general, which again will influence a users' perceived ease use of the technology (Igbaria and Iivari, 1995, Venkatesh and Davis 1996, Alenezi et al., 2010). We thus proposed the following hypotheses;

H7: Students' prior experience with electronic learning environment will positively influence students' perceived ease of use toward e-learning environment.

H8: Students' IT competence will positively influence students' perceived ease of use toward e-learning environment.

H9: Students' self-efficacy will positively influence students' perceived ease of use toward e-learning environment.

4 Research methodology

The design of this study involved three stages using wiki page tools in the blackboard system. Around 165 year 2 students from a traditional UK research university participated in the study during the first semester of academic year 2008–2009 for the Business Information Systems course. Students are required to form groups of 4–5 and are given a group assignment to collaboratively work on using a Wiki page in the virtual learning environment, Blackboard. The assignment specified the instruction for the use of the wiki page and a Youtube video was provided to further demonstrate its use.

4.1 Data collection

We have conducted two stages of data collection. The purpose of the first stage is to elicit factors influencing their participation in wiki pages. Students were informed that wiki pages will be used in their assignment and they were given two weeks to practice wiki pages in preparation for their assignment. An open questionnaire was then designed to elicit from students what factors will increase or decrease their use of wiki pages. To increase the response rate, students were given 0.5 mark for filling in the questionnaire. 85 students responded to the open questionnaire. Factors gathered from the students' feedback were then analysed to design the questionnaire for the second stage data collection. The actual questionnaire and measurement of items were then constructed from previous literature. The purpose of the second stage is to collect the data for the questionnaire. Students participated in group assignment and finished the group assignment in the December of year 2009. They were told that they will be given another 0.5 mark if they could finish the formal questionnaire. The questionnaire was posted via survey monkey for three weeks and students were reminded of the questionnaire by email every week. A total of 126 students filled in the formal questionnaire with four incomplete questionnaires. As there were a total of 165 students, this represents a response rate of 76%. In the third stage, students were followed up six months after they have used the software. They were randomly selected to give feedback on their Wiki page usage experience.

4.2 Measurement

The variables in the research model were operationalized according to previous studies. Studies on perceived ease of use, perceived usefulness, and attitudes toward use have been well researched, especially in the context of the TAM application (Davis et al., 1989b, Moon and Kim, 2001, Teo et al., 1999, Davis, 1989). Their measurements have also been developed, validated, and adopted in much IT adoption and diffusion research. In this study, the items used to measure perceived usefulness, perceived ease of use, attitude toward use, intention to return, and actual system use were adapted from Davis (1989), Moon and Kim (2001), and Teo et al. (1999). The affect measure was adapted from Triandis (1980), who suggested the use of four pairs of semantic differential items—pleasant-unpleasant, enjoyable-disgusting, exciting-depressing and joyful-hateful. IT competence was measured by asking students whether they are familiar with IS technology, Internet applications, and tendency to find new ways to solve problems with IT. Wiki page experience was measured by asking students three questions, I have experience of using Wiki pages before; I had some knowledge on Wiki page before the assignment; I have used similar software to Wiki page before this assignment. Self-efficacy was adapted from

Compeau and Higgins (1995) who specifically developed the computer self-efficacy measurement scale and tested it with several other IS adoption variables. All measurement is measured with Likert 1–7 scales. The description of each item for each questionnaire is listed in Table 1.

To ensure the validity and reliability of the questionnaire, whenever possible, use was made of previously validated questions and generally accepted online instrument construction guidelines (Ridings et al. 2002; Stanton et al. 2001; Wang et al. 2003) were observed as much as possible.

5 Data analysis results

There are 122 valid questionnaires received, among which 56 of them are female and 66 of them are male. They are all single and the majority of them are from the UK. 86 of them from UK, 13 of them are from China, and the rest of them are from India, Italy, France, and USA.

Structural Equation Modelling by Lisrel 8.80 with Maximum Likelihood method was used to analyse the research model. A two-step measurement model and structural model analysis approach was employed, based on the recommendation of Anderson and Gerbing (1988), and CFA using LISREL 8.80 was conducted to test the measurement model. Scale reliability and validity were assessed via CFA and Cronbach's alpha.

5.1 Analysis of measurement model

Scale reliability and validity were assessed with Confirmative Factor Analysis (CFA) and Cronbach's alpha. Since there is not a perfect fit index, it is recommended that researchers report their research result using a combination of the fit indices. This study chose the goodness of fit index (GFI) as its combination of fit indices, the adjusted goodness of fit index (AGFI), and root mean square residual (RMSR) from the absolute fit indices, the non-normalized fit index (NNFI) and IFI from the relative fit indices, and the comparative fit index (CFI) and root mean square error of approximation (RMSEA) from the noncentrality fit indices. The cut-off criteria for the fit indices are based on those of Hu and Bentler (1999).

The goodness of fit indices for both the measurement model and the structural model is reported in Table 2. Overall, the measurement model suggests that the model has a good fit. Although the GFI and AGFI indices failed to meet the recommended minimum values, GFI's value discrepancies (0.08 for the measurement model and 0.11 for the structural model) and AGFI's value discrepancies (0.14 for the measurement model and 0.16 for the structural model) led us to believe that the model fit was reasonably adequate for assessing the results for the structural model.

The measurement model was further assessed for construct reliability and construct validity. Construct reliability was assessed at three levels: Cronbach's alpha, item reliability, and composite reliability. The descriptive statistics and Cronbach's alpha are reported in Table 2. As indicated in Table 2, the Cronbach's alpha values of all variables are above the 0.70 level that is suggested for exploratory research (Nunnally and Bernstein, 1994), thus supporting the reliability of our measurements for model testing. As shown in Table 3, all item reliabilities exceeded 0.50 except PU5 (0.37) and showed an acceptable level of item reliability. We thus dropped PU5 from the PU measurement and the fit indices of the measurement model after dropping PU5 are reported in Table 2. It is suggested that there is no much differences for the fit indices after dropping PU5 in the measurement model. The composite reliabilities shown in Table 2 demonstrate acceptable values above the threshold of 0.70 as suggested by Fornell and Larcker (1981).

Construct validity was assessed at two levels: factor loading and average variance extracted, for convergence validity and discriminant validity. As shown in Table 3, all factor loadings exceed the recommended 0.70 value suggesting that all the constructs have an acceptable convergent validity. It was found that that all the average variances extracted (as shown in Table 3) were above 0.5, which surpassed the minimum recommended value. Based on these statistical analyses, I conclude that the tests for both factor loading and average variance extracted do not show any significant violations, thereby demonstrating adequate convergence validity of the model. The discriminant validity can be assessed by comparing the shared variance among constructs with the average variance extracted. Our test results, which are depicted in Tables 4, show that all average variances extracted are above 0.5, which surpasses the minimum recommended value. In addition, the shared variance among variables of all entries is found to be consistently lower than the average variance extracted. Although the values of some shared variances exceed the average variance extracted, these violations are quite limited. These findings suggest that the measures are distinct and unidimensional, thereby ensuring the discriminate validity at the construct level.

5.2 Analysis of structure model

As for the structural model, shown in Table 1, all the fit indices are within the acceptable levels, which indicates that the model has a good fit, except that GFI is 0.70 and AGFI is 0.65, both of which are lower than the 0.80 cut-off point, though this is still acceptable. The model testing results are summarized in Fig. 2.

The explanatory power of the structural model was assessed in terms of the portion of variance it explains. As shown in Fig. 2, 67% of the variance of intention to return to the electronic learning environment is explained by the structural model. 84% variance of attitude is explained by the model, 48% variance of the perceived ease of use is

Table 1 Item Description

Construct	Item Description
ITOR	Intention to Return
ITOR1	If given the opportunity, I would like to participate in a similar assignment with Wikipage.
ITOR2	If given the opportunity, I will use Wikipage on a regular basis in the future to do assignment.
ITOR3	If given the opportunity, I will frequently use Wikipage in the future.
ITOR4	If given the opportunity, I will strongly recommend others to use Wikipage.
AFF	Affect
AFF1	Disgusting 1 2 3 4 5 6 7 Enjoyable
AFF2	Dull 1 2 3 4 5 6 7 Exciting
AFF3	Unpleasant 1 2 3 4 5 6 7 Pleasant
AFF4	Boring 1 2 3 4 5 6 7 Interesting
ATT	Attitude
ATT1	In my opinion, it is desirable to use Wikipage.
ATT2	I think it is good for me to use Wikipage.
ATT3	Overall, my attitude towards Wikipage is favourable.
AU	Actual Usage
AU1	I use wikipage very frequently to do assignment. (many times per week).
AU2	I use wikipage very intensively to do assignment (many hours per week).
AU3	Overall, I use wikipage heavily to do the assignment.
PU	Perceived Usefulness
PU1	I can accomplish my assignment more quickly using Wikipage.
PU2	I can accomplish my assignment more easily using Wikipage.
PU3	Wikipage enhances my effectiveness in accomplishing assignments.
PU4	Wikipage enhances my efficiency in accomplishing assignments.
PU5	Wikipage enables me to communicate better with my group members in accomplishing assignments.
PU6	Overall, I find Wikipage useful.
PEOU	Perceived Ease of Use
PEOU1	Learning to use Wikipage is easy for me.
PEOU2	It is easy to use Wikipage to accomplish my assignment.
PEOU3	Overall, I believe Wikipage is easy to use.
PE	Prior Experience
PE1	I have experience of using Wikipages before.
PE2	I had some knowledge on Wikipage before the assignment.
PE3	I have used similar software to Wikipage before this assignment.
ITC	IT Competence
ITC1	I am good at using many information systems software.
ITC2	I am good at using many internet applications.
ITC3	I am good at applying IT to solve problems in a new way.
ITC4	Overall, my IT skills are very good.
SEFF	Self Efficacy
SEFF1	If I had seen someone else using it before trying it myself.
SEFF2	If I could call someone for help if I got stuck.
SEFF3	If someone else had helped to get started.
SEFF4	If I had a lot of time to complete the job for which the software was provided.
SEFF5	If someone showed me how to do it first.
SEFF6	If I had used similar packages before this one to do the same job.

explained by the model, and 49% of the variance is explained by the research model.

The significance of the hypotheses and the relative strength of the individual path are reported in Fig. 2. The analysis results

Table 2 Overall Goodness of Fit Indices

	χ^2	df	NNFI	CFI	IFI	GFI	AGFI	SRMR	RMSEA
Recommended Value			≥ 0.90	≥ 0.90	≥ 0.90	≥ 0.80	≥ 0.80	≤ 0.11	≤ 0.10
Measurement Model	941.43	558	0.97	0.97	0.97	0.72	0.66	0.052	0.072
Measurement after dropping PU5	824.40	524	0.97	0.97	0.97	0.73	0.67	0.051	0.064
Structural Model	1037.47	541	0.96	0.96	0.96	0.70	0.65	0.18	0.074

showed that six hypotheses are supported, H1 Affect→ intention to return, H2 Attitude→Intention to return, H4 PU→Attitude, H6 PEOU→PU, H8 IT competence→PEOU, and H9 Self-Efficacy→PEOU. Three hypotheses are not supported, H3 Actual usage→Intention to Use, H5 PEOU→Attitude, H7 Prior experience→PEOU.

Table 5 summarizes both the direct and indirect effects of the respective factors on intention to return to use Wikipedia. Attitude has the largest effect on intention to return, followed by perceived usefulness and perceived ease of use. The second group of factors that have strong effect on intention to return are affect, IT competence, and Self-Efficacy. The effect of actual usage and prior experience on intention to return to use Wikipedia is very weak.

6 Feedback after six months

Six months after the questionnaire when the course have finished, several students are randomly interviewed for their impression of group assignment experience with Wikipedia. Most of them expressed that the Wikipedia assignment experience is fun and interesting. They commented that the wikipage assignment has increased their confidence with technology, which have strengthened the data analysis result that self-efficacy is a significant predictor for students' continuance intention to use wikipages. Another student also commented that the wikipage assignment experience has changed her attitude toward the technology and it's very useful to her study and she will recommend it to be used by other lectures. This further supported that attitude is the strongest factor to change students' continuance intention to use wikipages. When the new academic year started after the Wikipage assignment, some of them recommended wikipage to be used in a marketing communication course, taught by a lecturer not very familiar with e-learning tools. The marketing lecturer demonstrated a strong intention to adopt wikipage as group assignment tool. It's evident that Students' motivations to return to use Wikipedia are aroused and strong.

7 Discussions, implications and limitations

It is important for lecturers to understand what influence students' intention to use electronic learning environment, especially to those situations where blackboard system is heavily

invested by sparsely used. Students' continuance intention to use electronic learning environment are important because they need to re-use the electronic learning tools such as Wikipedia from course to course. Most of time, it's not the technological issue that hinders the wide adoption of e-learning tools but lack of understanding about students and clear guidance to use the technology. This paper investigates students' continuance intention to use Wikipedia with the extended TAM model. The model adopts several important variables to align with previous studies, such as emotional variable affect and self-efficacy. Several other variables such as prior experience and IT competence are also tested. The overall model testing resulted showed that the extended TAM model is effective in explaining students' continuance intention to use wikipages.

7.1 Discussions

The model analysis results show that TAM is effective in explaining students' intention to return to use the Wikipedia. Specifically, several important factors including affect, attitude, perceived usefulness, perceive ease of use play a strong role in explaining the students' continuance intention to use Wikipedia. The result is consistent with conclusions from previous studies (Alenezi et al., 2010) that emotional factors such as self-efficacy and computer anxiety are influential on the students' usage of an electronic learning environment. Our results differ from Shroff et al.'s findings (2011) that perceived ease of use is the most important factor in predicting intention to use e-portfolio system although perceived ease of use is still an important factor in influencing the students' intention to return to use Wikipedia. We guess the reason is because wikipage is an easy to use technology compared to e-portfolio system.

In this study attitude is found to be the strongest factor in influencing students' continuance intention to use the Wikipedia. Attitude is influenced by perceived ease of use and perceived usefulness, which is consistent with many previous literature in other technologies as well as educational studies (Tamjidyamcholo et al., 2013, Shroff et al., 2011, Lee, 2010, Alenezi et al., 2010, Sanchez-Franco, 2010). Perceived ease of use is strongly influenced by self-efficacy and IT competence, which also supported previous studies for this relationship (Venkatesh and Davis 1996) but our study

Table 3 Summary of Measurement Scales

Construct	Mean	S.D.	Cronbach's Alpha	Factor Loading	Item Reliability	Composite Reliability	Average Variance Extracted
Intention to Return (ITOR)							
ITOR1	4.25	1.75	0.96	0.93	0.86	0.96	0.86
ITOR2	4.07	1.73		0.96	0.92		
ITOR3	3.99	1.66		0.95	0.90		
ITOR4	4.28	1.68		0.87	0.76		
AFF (Affect)							
AFF1	4.78	1.40	0.93	0.88	0.77	0.93	0.78
AFF2	4.35	1.48		0.82	0.67		
AFF3	4.70	1.32		0.89	0.79		
AFF4	4.39	1.53		0.90	0.81		
ATT (Attitude)							
ATT1	4.39	1.63	0.94	0.92	0.83	0.94	0.84
ATT2	4.54	1.58		0.93	0.86		
ATT3	4.41	1.60		0.91	0.83		
AU (Actual Usage)							
AU1	4.16	1.74	0.91	0.85	0.72	0.91	0.78
AU2	3.89	1.61		0.93	0.86		
AU3	4.26	1.68		0.86	0.74		
PU (Perceived Usefulness)							
PU1	4.74	1.52	0.93	0.85	0.72	0.95	0.78
PU2	4.60	1.48		0.86	0.74		
PU3	4.38	1.41		0.92	0.85		
PU4	4.39	1.42		0.93	0.86		
PU5	4.51	1.69		0.61	0.37		
PU6	4.75	1.58		0.85	0.72		
PEOU(Perceived Ease of Use)							
PEOU1	5.14	1.54	0.92	0.85	0.72	0.92	0.80
PEOU2	5.07	1.51		0.92	0.85		
PEOU3	5.23	1.42		0.91	0.81		
PE (Prior Experience)							
PE1	3.43	2.04	0.88	0.91	0.83	0.88	0.71
PE2	3.54	2.95		0.90	0.81		
PE3	3.73	2.83		0.71	0.50		
ITC (IT Competence)							
ITC1	5.07	1.41	0.95	0.94	0.88	0.95	0.84
ITC2	5.25	1.49		0.91	0.83		
ITC3	4.99	1.44		0.92	0.85		
ITC4	5.13	1.43		0.89	0.79		
SEFF (Self Efficacy)							
SEFF1	4.84	1.46	0.93	0.79	0.62	0.93	0.68
SEFF2	4.89	1.51		0.80	0.64		
SEFF3	4.75	1.50		0.79	0.62		
SEFF4	4.82	1.46		0.83	0.69		
SEFF5	4.24	1.43		0.87	0.76		
SEFF6	4.07	1.50		0.87	0.76		

Table 4 Average Variance Extracted

	ITOR	Attitude	PU	PEOU	Affect	Usage	Experience	Competence	Efficacy
ITOR	0.86								
Attitude	0.61***	0.84							
PU	0.50***	0.83***	0.78						
PEOU	0.28***	0.48***	0.48***	0.80					
Affect	0.09***	0.00***	0.00***	0.01***	0.78				
Usage	0.03***	0.03***	0.03***	0.07***	0.18***	0.80			
Experience	0.03***	0.04	0.04*	0.08**	0.01	0.03	0.71		
Competence	0.11***	0.18***	0.18***	0.38***	0.01	0.12**	0.16***	0.84	
Efficacy	0.07***	0.12***	0.12***	0.24***	0.01	0.06*	0.07*	0.10**	0.68

1. Values on the diagonal represent the average variance extracted. Values off the diagonal represent the shared variances

2. The significance level is based on the estimated covariance matrix of independent variables in the lisrel measurement model, * significant at 0.05 level, significant at 0.01 level, significant at 0.001 level

used SEM method to give the specific coefficient compared to Alenezi's (2010), where only regression method is used.

Contrary to our initial hypothesis, actual use does not have a significant effect toward continuance intention to use wikipages, implying that the actual usage does not reinforce the future intention to use wikipages. A possible explanation for this non-significance might be the alternative relationship of habit and usage brought by Triandis (Triandis, 1977), where the actual usage will increase the tendency to set up a new behaviour habit rather than strengthen the existing intention. The relationship is worth further investigation. Another interesting finding is that prior experience of wikipedia usage here won't affect the perceived ease of use of the wikipedia, implying that practice more might not diminish the difficulty of the technology.

7.2 Implications

This research is not only a test of previous research model but a starting point for many more future studies, particularly in the context of the emerging economy where new e-learning system is under development. When applying or extending

this study in such context as emerging economy in China, there are many interesting angles to pay attention to.

Culture might sound cliché but definitely the foremost theoretical perspective to consider. Culture is the shared values and meaning among a group of people. Apparently, Asian countries such as china shared different values and meaning from western people. As previous study have found, Asian culture such as china emphasizes more on collectivism rather than individualism in the western society (Hofstede, 2001), which could explain many interesting phenomenon even in the electronic environment. For example, it is reported by Adeoye and Wentling (2007) that national culture has effects on the usability of the e-learning system, particularly the uncertainty avoidance score. Previous study have also pointed out that saving face might be a reason why some Chinese members reluctantly share their opinion in the knowledge community (Alexandre et al., 2006). When designing or implementing the e-learning tools such as blackboard system, it would encourage more participation from students when lectures give appreciation or incentives to those who “speak” in e-learning environment. Power distance is another

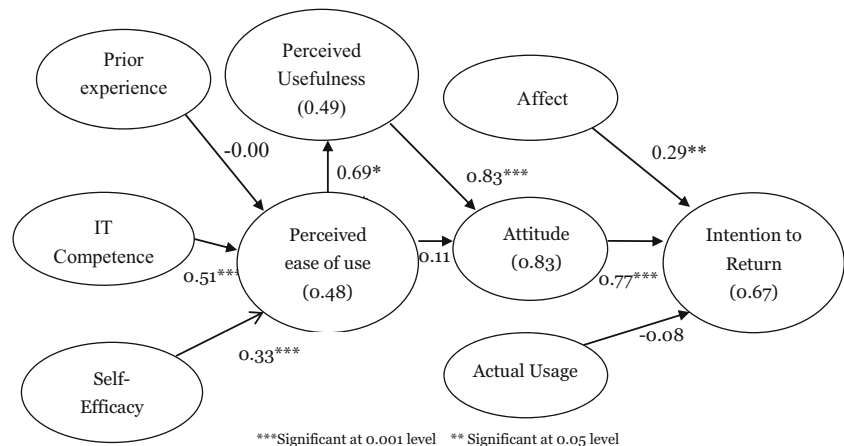
Fig. 2 Research model test results

Table 5 Strengths of individual factor

Direct effect	Effect Size	Total Effect
Affect	0.29	0.29
Attitude	0.77	0.77
Actual Usage	−0.08	−0.08
Indirect effect		
PU	0.64	0.64
PEOU	0.53	0.53
Prior Experience	0.00	0.00
IT Competence	0.27	0.27
Self-Efficacy	0.17	0.17

important culture dimension when considering e-learning system design. In western culture, power distance between students and lecturers are less than those in China, which might affect the participation in the e-learning environment. It is thus suggested that lecturer's influence might be considered as either a factor or a moderator in the model. The third important culture dimension might be peer influence. As people are more easily influenced by others' in the collectivism culture, subjective norms might be a significant factor when investigating students' intention to use wikispaces.

Thus, to extend our research scope to the Chinese cultural context, it is necessary to identify Chinese-specific factors and integrate these factors into our extended TAM model. According to the cultural differences, we proposed two potentially significant factors, normative belief (Van Raaij and Schepers, 2008) (Vijayasarathy, 2004) and personal innovativeness (Schillewaert et al., 2005). The former is from theory of reasoned action (Fishbein and Ajzen, 1975) and theory of planned behavior (Ajzen, 1991) and specifies the person's perception that most people who are important to him think he should or should not perform the behaviour in question. The latter generally means openness to change, and in this research scope it particularly indicates the capability that a learner adapts to new e-learning systems, and during the process reveal the usefulness and ease of use. A recent study in Chinese e-learning context (van Raaij & Schepers, 2008) has already proven that these two factors have either direct or indirect effects on perceived ease of use, which is also one important factor in influencing the students' continuance intention to use wikispaces. We believe that it is significant to explore such factors and improve our model accordingly, so that the proposed model will be able to achieve a more comprehensive fit to the context of Chinese education institutions in future.

Practically, the conclusions from this study provide implications for lecturers when they design their assignments for students to use electronic learning tools such as Wikipedia. When implementing a new electronic learning tool, lecturers should first try methods to arouse students' strong intention to

use the tool. Because intention is strongly influenced by attitude and affect toward the electronic learning tool, lecturers should design the assignment and delivery of the assignment to change students' attitude toward the electronic learning tool. The attitude are influenced by perceived ease of use and perceived usefulness, lecturers should emphasize the importance of the electronic tool in their assignment. At the same time, students' should be encouraged for nurtured to grow their self-efficacy and IT competence in information technology to improve their perceived ease of the electronic tool.

The e-Learning market has a compound annual growth rate of more than 27% (Baker, 2012) but under-utilized and failure examples still exist (Wu et al., 2006). This study provides a comprehensive explanation about why some users stop their online learning after their initial experience rather than only common answers in previous literature, such as user satisfaction. The findings presented in this paper will not only benefit the e-Learning institutions by providing insights to strengthen their e-Learning implementations and hence reduce possible failure risks, but also can be served as a basis to initiate other related studies in this research area.

7.3 Limitations

There are four limitations for our study. Firstly, this study only used the wikispaces tool in the blackboard system as the setting of the virtual learning environment, which is different from the pure virtual learning environment where the face to face communication is not in the learning process. When generalized to the pure virtual learning environment, the result might be different. Secondly, our study used the convenience sample from one cohort of students. Our sample size is relatively small compared to large and random samples. Lastly, our attitude and perceived usefulness shared a high level of covariance (0.83), which might have raised the issue of multicollinearity.

Appendix 1: Questionnaire in Stage 1 for the elicitation of factors influencing their usage of the Wikipedia

Please think of the act of using the WikiPage software for your group assignment.

Name, student ID

Gender

- List up to five things that have made it easy for you to use Wikispaces (for example having a Computer at home, training, prior knowledge of similar software)

- List anything that have prevented you from using Wikispaces during your group assignment

Is there any person who may have influenced your usage of Wikispaces during the assignment, such as group members?

- List up to five positive consequences that you expect from using Wikipage (example: better communication with your teammates)

- List up to five negative consequences that you expect from using Wikipage (example: less time for other forms of communication)

Please list your feeling about the wikipage (example: enjoyable, disgusting, hard)

- In the space below, put any additional comments on the use of Wikipage for group assignments.

Appendix 2: Questionnaire for the Research Model

Part I: Behavior and Intention to Return

The following questions investigate the wikipage usage behavior. Please indicate your level of agreement with the following statements: (1 = Strongly disagree, 2 = Disagree, 3 = Slightly disagree, 4 = Neutral, 5 = Slightly agree, 6 = Agree, 7 = Strongly Agree).

	Strongly Disagree				Strongly Agree		
Actual Usage							
I use wikipage very frequently to do assignment. (many times per week).	1	2	3	4	5	6	7
I use wikipage very intensively to do assignment (many hours per week).	1	2	3	4	5	6	7
Overall, I use wikipage heavily to do the assignment.	1	2	3	4	5	6	7
Continuance Intention to Use Wikipage							
If given the opportunity, I would like to participate in a similar assignment with Wikipage.	1	2	3	4	5	6	7
If given the opportunity, I will use Wikipage on a regular basis in the future to do assignment.	1	2	3	4	5	6	7
If given the opportunity, I will frequently use Wikipage in the future.	1	2	3	4	5	6	7
If given the opportunity, I will strongly recommend others to use Wikipage.	1	2	3	4	5	6	7
Attitude							
In my opinion, it is desirable to use Wikipage.	1	2	3	4	5	6	7
I think it is good for me to use Wikipage.	1	2	3	4	5	6	7
Overall, my attitude towards Wikipage is favorable.	1	2	3	4	5	6	7
Perceived Ease of Use							
Learning to use Wikipage is easy for me.	1	2	3	4	5	6	7
It is easy to use Wikipage to accomplish my assignment.	1	2	3	4	5	6	7
Overall, I believe Wikipage is easy to use.	1	2	3	4	5	6	7
Perceived Usefulness							
I can accomplish my assignment more quickly using Wikipage.	1	2	3	4	5	6	7
I can accomplish my assignment more easily using Wikipage.	1	2	3	4	5	6	7
Wikipage enhances my effectiveness in accomplishing assignments.	1	2	3	4	5	6	7
Wikipage enhances my efficiency in accomplishing assignments.	1	2	3	4	5	6	7
Wikipage enables me to communicate better with my group members in accomplishing assignments.	1	2	3	4	5	6	7
Overall, I find Wikipage useful.	1	2	3	4	5	6	7
IT Competence							
I am good at using many information systems software.	1	2	3	4	5	6	7
I am good at using many internet applications.	1	2	3	4	5	6	7
I am good at applying IT to solve problems in a new way.	1	2	3	4	5	6	7
Overall, my IT skills are very good.	1	2	3	4	5	6	7
Prior Experience							
I have experience of using Wikipages before.	1	2	3	4	5	6	7
I had some knowledge on Wikipage before the assignment.	1	2	3	4	5	6	7
I have used similar software to Wikipage before this assignment.	1	2	3	4	5	6	7
Self-efficacy							
I could complete the job using software applications							
If I had seen someone else using it before trying it myself.	1	2	3	4	5	6	7

(continued)

	Strongly Disagree				Strongly Agree			
If I could call someone for help if I got stuck.	1	2	3	4	5	6	7	
If someone else had helped to get started.	1	2	3	4	5	6	7	
If I had a lot of time to complete the job for which the software was provided.	1	2	3	4	5	6	7	
If someone showed me how to do it first.	1	2	3	4	5	6	7	
If I had used similar packages before this one to do the same job.	1	2	3	4	5	6	7	
Affect								
Please indicate your feeling about using Wikipage by choosing the degree of feelings from 1 to 7.								
Using Wikipage would be								
Disgusting	1	2	3	4	5	6	7	Enjoyable
Dull	1	2	3	4	5	6	7	Exciting
Unpleasant	1	2	3	4	5	6	7	Pleasant
Boring	1	2	3	4	5	6	7	Interesting

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