Perceived fit and satisfaction on web learning performance: IS continuance intention and task-technology fit perspectives

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Abstract

Virtual learning system (VLS) is an information system that facilitates e-learning have been widely implemented by higher education institutions to support face-to-face teaching and self-managed learning in the virtual learning and education environment (VLE). This is referred to a blended learning instruction. By adopting the VLS, students are expected to enhance learning by getting access to course-related information and having full opportunities to interact with instructors and peers. However, there are mixed findings revealed in the literature with respect to the learning outcomes in adopting VLS. In this study, we argue that the link between the precedents of leading students to continue to use VLSs and their impacts on learning effectiveness and productivity are overlooked in the literature. This paper aims to tackle this question by integrating information system (IS) continuance theory with task-technology fit (TTF) to extend our understandings of the precedents of the intention to continue VLS and their impacts on learning. By doing it, factors of technology-acceptance-to-performance, based on TAM (technology acceptance model) and TTF and post-technology-acceptance, based on expectation–confirmation theory, models can be included to test in one study. The results reveal that perceived fit and satisfaction are important precedents of the intention to continue VLS and individual performance. Later, a discussion and conclusions are provided. This study sheds light on learning system design as assisted by IS in VLE and can serve as a basis for promoting VLS in assisting learning.
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Keywords: Perceived fit; Satisfaction; Continuance intention; Virtual learning system (VLS); Virtual learning and education environment (VLE)

1. Introduction

A virtual learning and education environment (VLE) is an information system that facilitates e-learning (McGill and Hobbs, 2008). This web-based learning system, as it is referred to a virtual learning system (VLS) in our study, have been widely implemented by higher education institutions to support face-to-face teaching and self-managed learning (Eijl et al., 2005; Lin and Wang, 2011). By adopting the VLS, students are expected to enhance learning by getting access to course-related information and having full opportunities to interact with instructors and peers in VLE. This is referred to a blended learning instruction (Akkoyunlu and Soylu, 2008; Lim and Morris, 2009). However, there are mixed findings revealed in the

literature with respect to the learning outcomes in adopting VLS in blended-learning instruction (Hui et al. 2008; Hwang and Arbaught, 2009; Kember et al., 2010). In this study, we argue that the link between the precedents of leading students to continue to use VLSs and their impacts on areas, such as learning effectiveness and productivity, are overlooked and should be taken into consideration. This paper plans to tackle this question by combining information system (IS) continuance theory (Bhattacherjee, 2001) with task-technology fit (TTF) (Goodhue and Thompson, 1995) to further our understandings of the precedents of VLS continuance intentions and their impacts on learning. By doing it, factors of technology-acceptance-to-performance, based on TAM (technology acceptance model) and TTF and post-technology-acceptance, based on expectation–confirmation theory, models can be included to test in one study. Our study introduces the idea that the intention to continue VLS should be affected by the

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perceived fit of in accomplishing assignments and satisfaction with the VLS in satisfying learners' demands for gathering, constructing and sharing knowledge amongst peers. As well, VLS continuance intention should impact learner performance.

Past studies have asserted the importance of continuance intention (Bhattacherjee, 2001, 2008). By involving this concept in investigating user behavior in the adoption of IS as it reveals the true factors of success that depends on continued use rather than first-time use. This thread is adapted from the consumer behavior literature, which investigates post-purchase behavior, such as repurchase or complaining. The model of IS continuance intention has been tested in different cases, such as the continued involvement of open-source software developers (Wu et al., 2007), mobile Internet services (Thong et al., 2006) and web-based learning systems (Liao et al., 2009). Regarding task-technology fit, it was initially proposed by Goodhue and Thompson (1995) that links information systems with individual performance. It has been tested in cases involving group support systems' effectiveness (Zigurs and Buckland, 1998), the adaptation of wireless technology (Yen et al., 2010), users' adoption of mobile banking (Zhou et al., 2010), knowledge management systems (Lin and Huang, 2008), online auctions (Chang, 2010) and e-procurement systems (Chang et al., 2008).

In the domain of VLS, studies reveal the importance of investigating the role of TTF in motivating users to continue to use information systems (Larsen et al., 2009) and the effects of TTF on learning (McGill and Klobas, 2009). However, there is not a complete understanding of the post-technology-acceptance behavior of learners in terms of their intentions to continue to use a VLS and the link with learning impact on learning. This study integrates precedents variables in technology-acceptance-to-performance of perceived fit and satisfaction, and the post-technology-acceptance variable of VLS continuance intention to investigate impacts of utilizing VLS on learning. Research questions addressed in this paper are as follows: (1) how do the precedents variables of perceived fit and satisfaction affect VLS continuance intention; and (2) how do the precedents variables and VLS continuance impact learning as perceived by students? This paper thus aims to shed light on the effect on learner performance of adopting an IS in the virtual environment, which in this case is the VLS.

The remainder of the paper is organized as follows: The next section documents the theoretical background and presents the research model. The third section describes the research methodology, applying the PLS method to empirically test the proposed model. The fourth section presents the results of data analysis. The fifth section discusses research implications for the key findings. The main contributions and suggestions for promoting VLS, with its limitations, in education institutions are given in the last section.

2. Theoretical background and hypotheses

In an effort to add to this boy of research, we propose a conceptual model to examine the impacts of VLS continuance intention (as impacts by perceived fit and satisfaction) on selected user attitudes such as perceived fit (moderated by satisfaction) and perceived impacts on learning. Fig. 1 shows the model relationships and hypotheses. As discussed earlier, the focus of this study was to investigate the link between the precedents of leading students to continue to use VLSs and their impacts on learning effectiveness and productivity. The importance of VLS satisfaction for continuing web-based learning systems has long been noted (Chiu et al., 2007a, 2007b; Limayem and Cheung, 2008; Sørebø et al., 2009). However, we were interested to know the impacts of perceived fit in terms of the usefulness of utilizing VLS in assisting learning on continuance intention. In addition, we extend the post-technology acceptance model with learners' perceived impacts on learning. By doing so, this will expand our understanding of VLS continuance intention and its impact on individual performance as it is the main notion of technology-acceptance-to-performance theory. The individual components are discussed before the related hypotheses are stated.

2.1. Perceived fit

Researchers have empirically tested the positive relationship between perceived fit and utilization (Goodhue and Thompson, 1995). Utilization can be regarded as the behavioral intention to use (Yen et al., 2010) or as user adoption (Zhou et al., 2010). The link between perceived fit and VLS continuance intention is experimentally hypothesized. In our study, the construct is integrated to test the perceived value of satisfaction in terms of adopting VLS to fulfill the needs of gathering, constructing, or sharing knowledge. Therefore, we hypothesize the following:

H1. Perceived fit is positively related to satisfaction.

It is revealed that the perceived value of playfulness, the ease of use and the degree of usefulness are linked to task-technology fit (Chang, 2010). In our study, this construct is integrated to test the perceived value of satisfaction in terms of adopting VLS for fulfilling the needs of gathering,
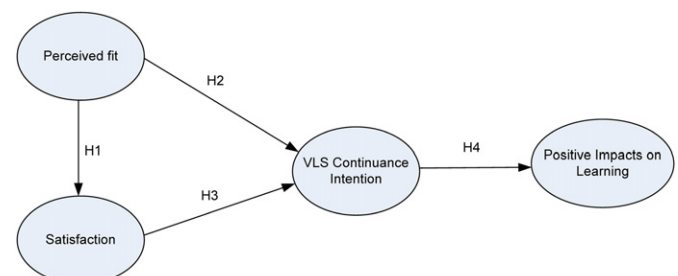

Fig. 1. The research model.

constructing, or sharing knowledge. Therefore, we hypo-thesize the following:

H2. Perceived fit is positively related to VLS continuance intention.

2.2. VLS satisfaction

This hypothesis is based on studies on IS continuance intention (Davis, 1989; Bhattacherjee, 2001; Bhattacherjee et al., 2008; Limayem and Cheung, 2008) and web-based learning continuance intention (Yeung and Jordan, 2007; Roca and Gagné, 2008). It reveals that satisfaction is linked with IS continuance intention. Therefore, we hypothesize the following:

H3. Satisfaction is positively related to VLS continuance intention.

2.3. VLS continuance intentions

The concept of IS continuance intentions has been empirically tested as the dependent variable in the case of online auctions (Wang and Chiang, 2009), online banking (Vatanasombut et al., 2008) and eTax (Hu et al., 2009). IS continuance behavior is defined as the continued sage of IS by adopters, where a continuance decision follows an initial acceptance decision (Bhattacherjee, 2001; Lim et al., 2007). In the case of web-based learning, the concept of VLS continuance intention is empirically examined as the dependent variable as well (Chiu et al., 2007a; 2008). Lin (2011) proposes that the attitude of adopting VLS has a relationship with continuance intention among more experienced students. Impacts on learners in blended learning instruction are discussed in the case of students (Lim and Morris, 2009; Lu et al., 2003) and teacher learning (Akyol and Garrison, 2010). Learner performance is evaluated using measurements of academic performance (Bliuc et al., 2010), given test with respect to selected domain (Holzinger et al., 2009); learning effectiveness (Hui et al., 2008) and satisfaction (Choi et al., 2007; Wan et al., 2008). Cheng (2011) proposes that the use of a web-based learning system could positively affect perceived performance impacts. By combining theory on IS continuance intention and TTF, we hypothesize the following:

H4. VLS continuance intention is positively related to positive impacts on learning.

3. Research methodology

Based on the model construct and previous research discussed above, a survey instrument, using a five-point Likert scale for each of the construct components, was developed. All the items used in each measurement have been referred to previous literature or been modified in accordance with the web-based learning system in virtual environment. The constructs, and their individual components, are discussed below; the survey instrument is given in Appendix A. The sources of the questionnaire items are given in Table 1.

3.1. Measurement development

All of the items (Table 1) were measured on a five-point Likert scale ranging from strongly agree (5) to strongly disagree (1). As part of its development, an earlier version of the scale was piloted to 40 subjects, and only those items with high loadings ($> .60$) were retained for the main study and data analyses. The constructs were referred to related literature as illustrated in the followings:

a. *Perceived fit*. This technology-acceptance variable is defined as a function of three orthogonal dimensions, balanced against cost in terms of utility (whether the system does what is needed functionally), usability (whether the users can actually work with the system successfully); and likeability (whether the users feel that the system is suitable) (Holzinger et al., 2011). Measures the extent of perceived fit in terms of the usefulness of utilizing a VLS. It includes the ease of accomplishing assignments, making good use of the VLS and learning. Shortening of time spent for course preparation and impact on effectiveness in learning also are included. Similar scales for this construct have been used in previous studies (McGill and Hobbs, 2008; Roca and Gagné, 2008).

b. *Satisfaction*. Measures the extent of learners' satisfaction with a VLS in terms of conducting knowledge management relevant to learning via the VLS. It includes user satisfaction with utilizing VLS as a learning tool for knowledge management and specifically for gathering, sharing, analyzing, and constructing knowledge. The scale used for this construct was adopted from McGill and Hobbs. (McGill and Hobbs, 2008).

c. VLS *continuance intention*. Measures the degree of learners' intention to continue using the VLS to conduct

Table 1
Variable definitions and measurements.

Code	Measurement construct	No. of tested variables	Sources
PF	Perceived fit	7	McGill and Hobbs, 2008; Roca and Gagné (2008)
SA	Satisfaction	7	McGill and Hobbs, 2008
CI	VLS continuance intention	7	Chiu et al. (2007a, b); Chiu et al., 2008
PIL	Impacts on learning	6	McGill and Klobas (2009)

knowledge management in the class. It includes the intention to continue to use it to gather, construct and share knowledge. Additionally, the willingness to use the VLS to prepare the course works and the perceived suitability of the VLS are included. The scale adopted followed that of Vatanasombut et al., used in the case of online banking, and that of Chan, used in the case of e-service tools (Chiu et al., 2007a, 2007b, 2008).

d. *Impacts on learning*. Measures learners' perceptions of the impact of the VLS on their learning (Lim and Morris, 2009; Akyol and Garrison, 2010). In order to avoid the indifferent standard in marking as the data was collected from courses that led by different instructors, the subjective way as measure learner performance by using measurements of earning scores (Bliuc et al., 2010) is not considered in this study. Also, as it is pointed out that the importance of learning effectiveness and satisfaction should be taken into consideration while investigating the issue of VLS success (Johnson et al., 2008). The scale proposed by McGill and Klobas in the case of web-based learning systems was adopted (McGill and Klobas, 2009). The degree to which learners perceived there to be learning includes the perceived effectiveness, productivity, importance, and helpfulness of the web-based learning systems for learning.

3.2. Survey administration

This study collected and analyzed perceptions of students who had took part in IS fundamentals courses, given by two instructors and two graduate teaching-assistants (TA). Both instructors utilize the virtual learning environment to assist face-to-face teaching and learning at the same level as organizing online discussions, uploading teaching materials online and giving feedbacks about submitted courseworks online. As well, instructors held office hours both online and in person. Instructors and TAs responded to the discussion boards from time to time and communicate with students intensively in class or after class by e-mail. Contents of the course mainly address the knowledge with regard to computer science, such as the introduction of computer hardware and software, for students in the business school to learn fundamental knowledge about computer science. The course was a semester long course (in this case 18 weeks). Assessments of the courses are evaluated by written exam, course works, class participants (both online/in class) and in-class oral presentation.

In order to higher the reliability of the collected data, the questionnaire (in printed version) was distributed in the end of the teaching weeks of 18 weeks with full orientation and been included as one of the course requirements.

3.3. Participants

The participants of this study were students at a major university in the south of Taiwan; the students used a virtual learning platform maintained by the university, while the instructors used the platform for teaching. By involving young students in this kind of study, it is often the case in empirical or experimental studies (Holzinger et al., 2011). The students used the web-based learning platform to gather teaching materials, share comments with classmates and exchange ideas about to assigned coursework. The subjects mainly majored in management-related subjects, such as business administration and information systems.

4. Data analysis

4.1. Demographic information

The demographic information of respondents ($n=165$) is shown in Table 2. A total of 44.8% ($n=74$) of respondents were male, and 55.2% ($n=91$) were female. A majority of respondents had one to two years ($n=145$, 87.9%) of experience utilizing VLS and actively participated in the

Table 2
Demographic analysis.

Variables	Categories	N	%
Gender	Male	74	44.8
	Female	91	55.2
Experience in utilizing the VLE	One to two years	145	87.9
	Three to four years	19	11.5
	More than four years	1	0.6
Majors	Management of information system	80	48.5
	Business administration	75	45.5
	Others (e.g., Education and engineering)	10	6
Ever submit course work via the VLE	Yes	163	98.8
	No	2	1.2
Ever join the discussion board for exchange knowledge via the VLE	Yes	141	85.5
	No	24	14.5
Ever check the feedback given by the lecturer via the VLE	Yes	135	81.8
	No	30	18.2
Being positive about utilizing the VLE in assisting learning	Yes	151	91.5
	No	14	8.5

teaching and learning activities held via the VLS. They mostly majored in the subjects of the management of information systems ($n=80$, 48.5%) and Business Administration ($n=75$, 45.5%). Most respondents have previously submitted coursework online ($n=163$, 98.8%), joined a discussion board ($n=141$, 85.5%) and checked feedback sent by lecturers ($n=135$, 85.8%). In terms of general perceptions regarding the use of VLS to enhance learning, the majority of subjects responded positively ($n=151$, 91.5%). Based on these, the selected subjects is representable to the group of VLS users as who have prior knowledge about utilizing VLS and experience in make use of VLS in assisting knowledge transfer in class and prepare courseworks. This group of subjects also is suitable to be tested in terms of post-technology-acceptance-performance domain in the sense that they have knowledge about adopting IS in the VLE.

4.2. PLS analysis

The t-test that measures the difference between two groups of subjects is applied as the data is collected from two groups led by different instructors ($n^{group1}=83$, $n^{group2}=82$). Results reveal that there is no statistic differences between these groups of data ($p > 0.05$). Therefore, the two set of data are merged to one for the following analyses. This study uses structural equation modeling (SEM), implemented using partial least squares (PLS), for its data analysis. SEM analysis was chosen over regression analysis because SEM can be used to analyze all of the paths, including moderate effects, in one analysis (Komiak and Benbasat, 2006). PLS is a latent structural equation modeling technique that utilizes a component-based approach to estimation (Karahanna et al., 2006). This technique provides the analysis of both a structural model (assessing the relationships among theoretical constructs) and a measurement model (assessing the reliability and validity of measures). PLS is a desirable research tool because it requires a small number of samples and places less restrictive demands on residual distribution (Chin et al., 2003; Cheung et al., 2009). We thus chose PLS to accommodate the presence of a number of variables, formative factors and moderating effects.

Our data analysis utilizes a two-step approach as proposed by Anderson and Gerbing (1988). The first step involves the analysis of the measurement model, whereas the second step tests the structural relationships among latent constructs. The aim of the two-step approach is to assess the reliability and validity of the measures before their application in the full model.

4.2.1. Measurement model

The measurement model was assessed in terms of item reliability, convergent validity, and discriminant validity tests. Individual item reliability can be examined by observing the factor loading of each item. A high loading implies that the shared variance between the construct and its measurement is higher than the error variance. A factor loading higher than 0.7 can be viewed as highly reliable, and a factor loading less than 0.5 should be dropped. Convergent validity is assured when multiple indicators are used to measure one construct, whereas construct reliability is demonstrated by the value of Cronbach's alpha. AVE, proposed by Fornell and Larcker (1981), considers the variance captured by the indicators. If the AVE is less than 0.5, the variance captured by the construct is less than the measurement error, and the validity of the single indicator and construct is questionable. Additionally, discriminant validity determines whether the measures of constructs are different from one another. It can be tested whether the square root of AVE is larger than the correlation coefficients (Parolia et al., 2007).

In accordance with the above, each indicator should load higher on the construct of interest than on any other latent variable. A number of variables were dropped because the factor loadings were less than 0.5. These variables include SA7, PF3, PF6, CI6, PI1 and PI2. After the amendments, all constructs in the model satisfied the requirements for reliability (composite reliability greater than 0.70) and discriminant validity (average variance extracted was greater than 0.50, and the square root of AVE was greater than each correlation coefficient) (Table 3). Additionally, the discriminant and convergent validity are examined for each indicator (Chin et al., 2003). The results demonstrate adequate discriminant and convergent validity (see Tables 3 and 4). There is a total of 21 variables included for the next stage of data analysis. The screenshot of PLS analysis is demonstrated in Fig. 2.

4.2.2. Structural model

Table 5 and Fig. 3 reveal the results of the path analysis. By applying the bootstrapping technique ($N=1000$) (Jörg et al., 2009), the path estimates and t-statistics were calculated for the hypothesized relationships. Additionally, to evaluate the structural models' predictive power, the R^2 values for predicting constructs of perceived usefulness, the intention to continue

Table 3
Reliabilities and discriminate validity.

| Model and construct | Mean | S.D. | Cronbach's alpha. | Composite reliability | AVE | Correlation of constructs | | | |
						CI	SA	PIL	PF
CI	3.49	0.71	0.89	0.92	0.64	**0.801**			
SA	3.23	0.80	0.90	0.92	0.66	0.624	**0.813**		
PIL	3.45	0.73	0.83	0.89	0.67	0.654	0.561	**0.817**	
PF	3.38	0.72	0.88	0.91	0.67	0.741	0.597	0.720	**0.819**

Table 4
Item loadings and cross-loadings.

	CI	SA	PIL	PF
CI1	**0.762**	0.371	0.464	0.500
CI2	**0.823**	0.494	0.506	0.624
CI3	**0.815**	0.625	0.493	0.513
CI4	**0.828**	0.440	0.562	0.643
CI5	**0.789**	0.564	0.619	0.608
CI7	**0.790**	0.491	0.481	0.655
SA1	0.579	**0.770**	0.516	0.516
SA2	0.518	**0.825**	0.438	0.476
SA3	0.485	**0.810**	0.410	0.441
SA4	0.510	**0.863**	0.416	0.536
SA5	0.484	**0.843**	0.468	0.513
SA6	0.451	**0.579**	0.483	0.409
PIL3	0.466	0.508	**0.762**	0.620
PIL4	0.544	0.430	**0.806**	0.548
PIL5	0.536	0.462	**0.859**	0.607
PIL6	0.581	0.444	**0.838**	0.586
PF1	0.615	0.431	0.655	**0.832**
PF2	0.615	0.508	0.600	**0.823**
PF4	0.653	0.788	0.541	**0.806**
PF5	0.542	0.554	0.509	**0.824**
PF7	0.607	0.461	0.645	**0.810**

VLS and positive impacts on learning were obtained. The R^2 value indicates the amount of variance explained by the exogenous variable (Barclay et al., 1995). The results indicate that all constructs had a positive and significant effect, which are consistent with the research hypotheses.

The results of the path analysis are presented in Table 5. The results of H1 and H2 reveal that perceived fit is related to satisfaction (path coefficient = 0.597, $t = 8.950$, $p < 0.000$) and VLS continuance intention (path coefficient = 0.572, $t = 9.244$, $p < 0.000$). A test of H3 reveals that satisfaction is related to VLS continuance intention (path coefficient = 0.283, $t = 10.396$, $p < 0.000$). A test of H4 proves that VLS continuance intention is related to positive impacts perceived by learners (path coefficient = 0.654, $t = 11.015$, $p < 0.000$). The structural model predicts 43% of the variance in positive impacts on learning. As discussed above, it is noted that variables as PI1 and PI2 are dropped due the low factor loadings (< 0.5), perspectives of perceived impacts in terms of importance and helpfulness in adopting VLS are included in the final data analyses. Therefore, the variable of post-technology-acceptance-performance can be objectively evaluated.

To further explore the data set, post-hoc analyses were performed by running further models with the individual driver variables of perceived fit and satisfaction using the PLS-product indicator approach suggested by the literature (Chin et al., 2003; Cheung et al., 2009). Results reveal there are direct effect between PF to PIL (path coefficient = 0.726, $t = 14.933$, $p < 0.000$) and SA to PIL (path coefficient = 0.209, $t = 2.781$, $p < 0.01$), respectively; however, CI is not statistically significant for PIL (path coefficient = 0.186, $t = 1.861$, $p > 0.05$). It is revealed that there are significant relationships between PF to PIL and SA to PIL. Moreover, the R^2 value of

PIL increases to 57%. Therefore, the research model is modified in accordance with the new findings (shown in Table 6 and Fig. 4). Comparing the proposed research model with the modified one with new findings, the direct links between PF to PIL and SA to PIL significantly increase the explanatory power (the value of R^2) (Sun et al., 2010) of PIL by an additional 14%. It is noted that the modified model can better explain 57% of the variance in positive impacts on learning. Therefore, the modified model should be used to more completely explain the effects of perceived fit and the confirmation of adopting VLS on perceived impacts on learning. Discussion will be given based on the new findings next.

5. Discussion and implications

In this study, we empirically examine current theories within the subject of technology continuance intention by combining the concept of perceived fit and experimentally testing the role between VLS continuance intention and the perceived impacts of a VLS on learning. Perceived fit ($\beta = 0.572$, $p < 0.000$) and satisfaction ($\beta = 0.283$, $p < 0.000$) are positively related to VLS continuance with effect size (R^2) as 60%, whereas perceived fit is related to perceived satisfaction ($\beta = 0.597$, $p < 0.000$) with effect size (R^2) as 36%. It adds new findings with respect to IS continuance intention theory about how to keep students utilizing VLS. It reveals that the technology-acceptance-to-performance variables of perceived fit and satisfaction are important in determining the level of VLS continuance. It suggested that the educational institutions should continue to update and create usefulness functions made available by a VLS for assisting learning. Once students accept the VLS technologies, there is a greater tendency to continue to use them. In blended learning instruction, university administrators and instructors should try to promote the idea of self-learning in order to motivate students to actively adopt VLS in virtual learning environment. Once learners recognize the effectiveness in learning can be assisted by VLS, they will tend to continue to use the information system.

Second, this is the first study to extend theory based on IS continuance intentions and TTF to the context of the perceived impacts on learning denoted in this study. In doing this, it echoes the notion of the technology-to-performance chain (Goodhue and Thompson, 1995), as it is shown that the performance impacts are influenced by students' and instructors' utilization of a virtual learning system (McGill and Hobbs, 2008). It echoes to the study conducted by Urbach et al. (2010), it is also consistent with the finding that the use of IS (an employee portal in their study) has impacts on individuals, enabling them, for example, to accomplish tasks more quickly, improve their job performance, and enhance their job effectiveness. As well, it adds new remarks to extend knowledge about information technology continuance (Thong et al., 2006) and learning design assisted by VLS (Kember et al., 2010) in the sense that teaching activities held via VLE as for
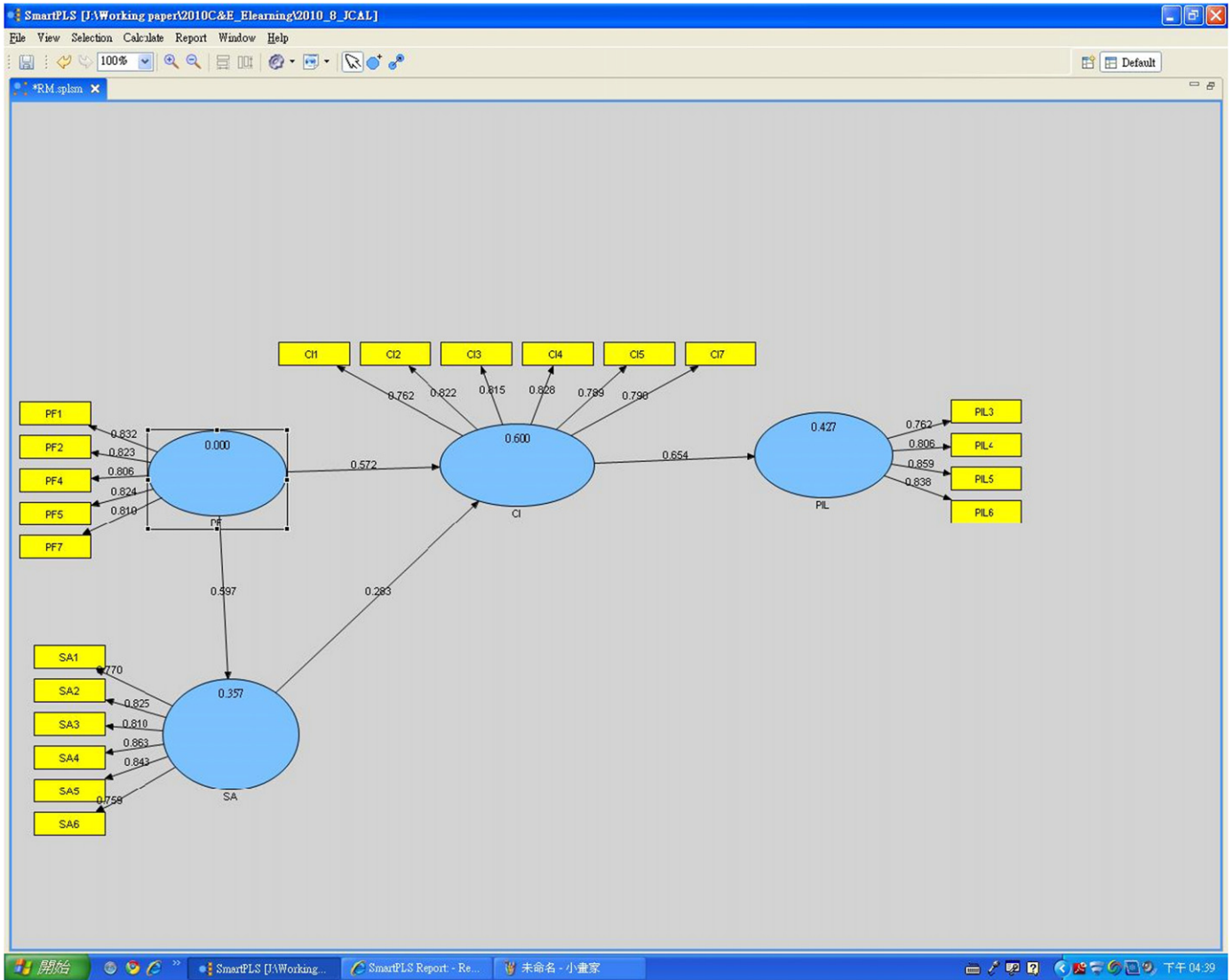
Fig. 2. The screenshot of PLS Analysis.

Table 5
Path analysis-hypotheses testing results.

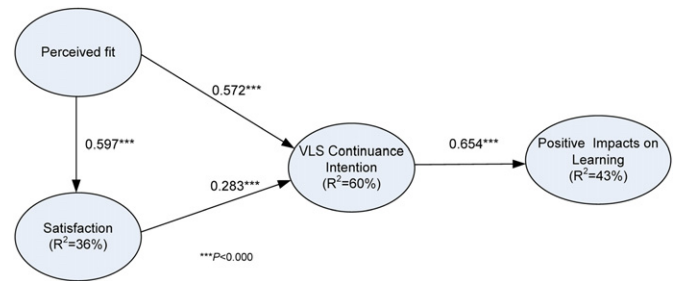|	Path coefficient	t-value
H1: PF→SAT	0.597	8.950***
H2: PF→CI	0.572	9.244***
H3: SAT→CI	0.283	10.396***
H4: CI→PIL	0.654	11.015***
	$R^2 = 43\%$	

***$p < 0.000$.

Fig. 3. Results of path analysis.

assisting knowledge transfer in class and shorten to time in preparing the courses may be the key issues that getting learners to enhance learning.

Third, the results reveal that perceived fit and satisfaction may directly link with perceived impacts on learning in terms of effectiveness, productiveness and helpfulness of VLS usage in virtual world. This echoes to the studies (Heine et al., 2003; Limayem et al., 2007) on the technology–performance relationship and IS continuance. This study adds a remark, based on prior studies of IS continuance intention (Bhattacherjee, 2001) and a merger of TAM and TTF (Yen et al., 2010) that the importance of perceived fit and satisfaction should not be overlooked. Thus, VSL and teaching instructors should collaborate in order to provide up-to-required features in assisting learning and up-to-date

Table 6
Path analysis-with new findings.

	Path coefficient	t-value
H1: PF→SA	0.595	8.950[***]
H2: PF→CI	0.741	9.244[***]
H3: SA→CI	0.284	10.396[***]
H4: CI→PIL	0.186	1.861[ns]
PF→PIL	0.726	14.933[***]
SA→PIL	0.209	2.781[**]
	$R^2 = 57\%$	

ns: not significant.
[***] $p < 0.000$.
[**] $p < 0.01$.
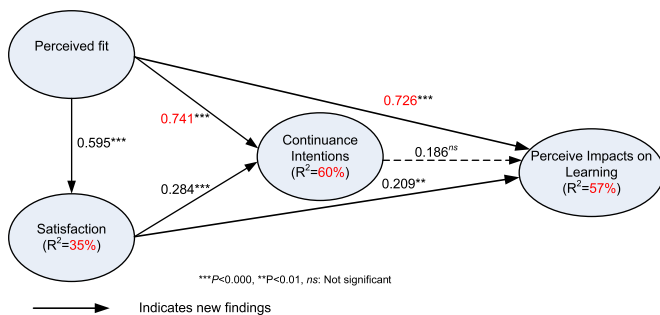
Fig. 4. Results of path analysis (with new findings).

information available online. In one hand, teaching instructors promote the usage of VLS or design teaching activities as online discussion board, online assignments or in-or-out of class discussion to get students to initiate utilizing VLS. On the other hand, VLS designers or university administrators should keep working with instructors and students in order to maintain and manage quality and usability of the VLS. Once the VLS can be recognized its importance in assisting learning, it can be promoted as an essential tool to improve teaching quality in VLE.

Fourth, perceived fit ($\beta = 0.726$, $p < 0.000$) and satisfaction ($\beta = 0.209$, $p < 0.01$) directly impact on learning with effect size (R^2) as 57%. It reveals that perceived fit is more than 3 times more important than satisfaction to dependent variable of impact on learning (Jörg et al., 2009). This extends our understandings that by offering features of VLS that can shorten learns' time spent for course preparations or aids received in completing assignments are critical. Learners' post-technology-acceptance attitude is oriented to how the level of learning performance can be lifted by adopting VLS. This also reflects the importance of the perceived fit of and satisfaction with a VLS in cases of blended learning instruction. As face-to-face teaching is offered, the importance of adopting VLS is more about enhancing learning and learner should perceive strong intrinsic motivation to proceed self-learning via VLS. This echoes previous studies (Larsen et al., 2009; Urbach et al., 2010), as it is proposed that satisfaction is directly related to IS continuance and individual impacts; the perceived task-technology fit is indirectly related to IS continuance intention but is directly related to individual impacts.

Fifth, by applying the multivariate analytical approach of PLS, this study validates the relationship of the two independent variables, perceived fit and satisfaction, in affecting the intention to continue utilizing VLS and perceived impacts on learning. The importance of these variables should be taken into account while managing, developing and promoting a VLS.

6. Conclusions

There are many IS studies that have validated theories of IS continuance intention and task-technology fit. This study is the first to empirically test a relationship by combining these two theories. The results reveal that VLS continuance intention is capable of mediating the effect of perceived fit ($\beta = 0.572$, $p < 0.000$) and satisfaction ($\beta = 0.283$, $p < 0.000$) on impacts on learning ($\beta = 0.597$, $p < 0.000$, $R^2 = 43\%$). However, the modified model, with new findings of links between perceived fit ($\beta = 0.726$, $p < 0.000$) and satisfaction ($\beta = 0.209$, $p < 0.01$), can explain 57%, as 14% of increases, of the variance in positive impacts on learning. This echoes the study conducted by Larsen et al. (2009) in the case of web-based learning systems among college teachers and Urbach et al. (2010) in exploring employee portal success. Additionally, there is no significant relationship found in the modified model between VLS continuance intention and impacts on performance. The results highlight the importance of the perceived fit of and satisfaction with a VLS, in the case of the adoption of an web-based learning system. They both may directly impact IS continuance intentions and personal performance.

This study has several limitations. First, the personal impacts on performance are evaluated by perceived impacts on learning. Subjective data are provided by subjects. Therefore, caution must be taken when adapting our findings and discussions to other cases of information systems. Objective indicators with respect to individual performance in terms of real learning scores or actual utilization duration can be considered in the future. Second, the factor of perceived fit is evaluated in terms of the ability to gather, construct or share knowledge from utilizing the VLS. It can be further expanded to examine the ease of use and usability, as it is noted in the study (McGill and Klobas, 2009). Third, the majority of respondents have one to two years' experience in utilizing the VLS. Familiarity of the VLS should be tested as a moderating factor in the use of a VLS. Fourth, the link between VLS continuance intention and perceived impacts on performance should be further tested. Because the results showing no direct relationship between the two are more significant, caution must be taken when adopting our findings for predicting the influence of perceived fit and satisfaction. Fifth, an organized interview with more participants should be conducted to collect more insights.

Appendix A. Survey items

Items used to measure constructs

Note: those marked with * were dropped from the final analysis after measurement model development

Satisfaction (1: Strongly Disagree; 5: Strongly Agree)(McGill and Hobbs, 2008)

1. I am satisfied to use the VLS as a learning tool
2. I am satisfied to use the VLS for knowledge management
3. VLS is efficient for knowledge gathering
4. VLS is efficient for knowledge analysis
5. VLS is effective for knowledge construction
6. VLS is effective for knowledge sharing
7. I am satisfied with the VLS and intend to use the VLS in future*

Perceived fit (1: Strongly Disagree; 5: Strongly Agree) (McGill and Hobbs, 2008; Roca and Gagné, 2008)

1. By using this VLS, it fits well the way I like to improve my learning in the subject of computer fundamental
2. By using this VLS, it fits well the way that I can upgrade the efficiency of my study
3. This VLS provides good functions to help me complete my learning tasks*
4. The VLS is compatible with all aspect of my study
5. By utilizing the VLS I can concentrate more on my other studies
6. For me using the VLS to prepare my study is not efficient*
7. I learn better with this VLS than without it

VLS Continuance intention (1: Strongly Disagree; 5: Strongly Agree) (Chiu et al., 2007a; Chiu et al., 2007b; Chiu et al., 2008)

1. I intend to continue use the VLS for knowledge gathering
2. I intend to continue use the VLS for knowledge construction
3. I intend to continue use the VLS for knowledge sharing
4. Next time I am willing to use the VLS to prepare the course works
5. I think the functions of the VLS are suitable for learners
6. I will recommend other people to use the VLS*
7. Overall, I intend to continue use the VLS

Positive impacts on learning (1: Strongly Disagree; 5: Strongly Agree) (McGill and Klobas, 2009)

1. This VLS has positive impacts on my learning in terms of effectiveness and productivity*
2. This VLS is an important and valuable aid to me in my study*
3. I have gained a clear understanding about the class
4. I can easily achieve the learning goals asserted by this course

5. By using this VLS, it is easier to accomplish the assignments
6. I am capable in learning how to make good use of this VLS

Appendix C. Supplementary information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.ijhcs.2012.01.006.

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