EXAMINING FACTORS AFFECTING COLLEGE STUDENTS' INTENTION TO USE WEB-BASED INSTRUCTION SYSTEMS: TOWARDS AN INTEGRATED MODEL

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ABSTRACT
With accelerated progress of information and communication technologies (ICT), web-based instruction (WBI) is becoming a popular method for education resources distributing and delivering. This study was conducted to explore what factors influence college students' behavioral intentions to utilize WBI systems. To achieve this aim, a WBI system was developed and employed in a vocational college in Taiwan to support undergraduate courses learning. Drawing on the concepts from Technology Acceptance Model (TAM), Theory of Reasoned Action (TRA), and Social Cognitive Theory (SCT), this study proposes a nomological framework and develops an instrument for measuring college students' intention to use the WBI platform. The empirical results indicate that students show great readiness and positive intentions towards the system for their web-based learning activities and expose a possible benefit from its use in the long term. The research findings can provide instrumental suggestions for web-based instruction practices and may serve as instrumental guidelines for WBI systems to be effectively designed to advance college students' interests and activations in the virtual learning environment.
Keywords: Web-based instruction (WBI), Partial least squares (PLS), Technology acceptance model (TAM), Theory of reasoned action (TRA), and Social cognitive theory (SCT)

INTRODUCTION

Today, the ubiquity and prevalence of web-based applications in school and at home make learning and teaching through the Internet a popular method in education (Ferdig, 2005). The use of the Internet and Web technologies as an instructional tool has been regarded as an alternative education form which provides a solution for current instructional problems and creates an innovative learning environment (Fish & Gill, 2009; Tutkun, 2011). As such, various sorts of web-based instruction (WBI) platforms are developed for distributing and delivering education resources.

With the application of WBI, instructional delivery and communication between teachers and students can be performed synchronously or asynchronously. WBI systems can provide a variety of instructional aids and communication methods, and offer great flexibility for the time and place of instruction. As a result, this new type of web-based application may better accommodate the needs of learners or instructors who are geographically dispersed and have conflicting schedules (Cavas et al., 2009; Dabaj, 2009). While the Internet is becoming a new medium for learning material delivering and skills/knowledge learning, the mechanisms concerning web-based instruction are not completely understood, and the underpinning theoretical backgrounds are also not well established (Shin et al., 2012). The underdevelopment in this area necessitates researchers in

several disciplines to join together to clarify what underlying factors would actually influence students' intention to use WBI systems and what the influence level of each factor concerning students' perceptions would be in such a virtual learning environment.

As the wide spread of WBI courses continues to influence students all over the world, it is critical to understand the factors to improve teachers' instruction and students' learning. The integration of Internet and Web technologies with online learning has shifted the focus from a teacher-centered classroom toward a learner-centered environment which empowers the learners with the control over the course contents and the learning processes (Fotos & Browne, 2004). In this regard, students' perceptions on the use of WBI systems need to be carefully examined. This study contributes to the body of knowledge by identifying the underlying factors influencing students' propensities towards the use of WBI systems and deliberately constructing a comprehensive conceptual framework to validate the influence level of each latent variable on students' behavioral intentions to use a WBI platform.

LITERATURE REVIEW

Three streams of theoretical works including Technology Acceptance Model (TAM), Theory of Reasoned Action (TRA), and Social Cognitive Theory (SCT) underpin this study's conceptual development. First, TRA provides the support for the determination, influenced by the individual's attitude and/or subjective norm (i.e., social influence in this study), on students' behavioral intention to use WBI. Next, TAM serves as an initial foundation for examining the relationships among students' perceptions on usefulness and ease of use, and behavioral intention towards the use of WBI systems. Finally, SCT present a sound theoretical base for the measuring of the cognitive factor to behavioral intentions to use WBI systems. Based on these three streams of works and other prior literature, this study develops a comprehensive model and the corresponding measures of the critical constructs of the research framework.

Theory of Reasoned Action (TRA) posits that an individual's performance of a specified behavior is determined by his or her behavioral intention to perform the behavior, and behavioral intention is jointly determined by the individual's attitude and subjective norm concerning the behavior in question (Ajzen & Fishbein, 1980). According to TRA, the intention to perform has direct influence on the actual behavior because people usually behave according to their intention to do it in an appropriate context and time. Therefore, TRA is regarded as an intention model per se which views the intention as the immediate determinant of the action. In addition, the individual's perceptions and beliefs, social influences may affect behavior. In TRA, social influence is named "subjective norm", defined as a "person's perception that most people who are important to him think he should or should not perform the behavior in question" (Fishbein & Ajzen, 1975). It is identified as a direct determinant of behavioral intentions in this theory. From this perspective, students may choose to use WBI systems not only because that they perceive learning via web-based environment would be useful or enjoyable, but also for the essential reason that they perceive the pressure from the people who are important to them, such as teachers, classmates, and parents.

Developed by Davis (1989), Technology Acceptance Model (TAM) is derived from Fishbein and Ajzen's Theory of Reasoned Action (TRA) to explain and predict the individual's acceptance of IT. It proposes that perceived usefulness (PU) and perceived ease of use (PEOU) of IT are the two important determinants in predicting individuals' acceptance and use of IT. As TAM is developed for tracing the impacts of external factors on internal belief, attitudes, and intentions, IS researchers have conducted plenty of studies that utilized TAM as a base to identify other determinants and relationships specific to particular IT usage in various contexts. For the past two decades, prior literature (e.g., Agarwal and Karahanna, 2000; Venkatesh & Davis, 2000) have proved that TAM is a powerful model in studies of the determinants of emerging information technology acceptance.

Social cognitive theory (SCT) is based on the concept that personal factors, environmental factors, and behavior are reciprocally interrelated (Bandura, 1986). An individual would explain, choose, and influence environment with cognitive factors in addition to being affected by environments. Behavior can then be influenced by environment; in the meantime, environment can be changed by behavior. As a consequence, cognitive and personal factors affect behavior, and in turn, are influenced by behavior (Bandura, 1986). According to SCT, self-efficacy is identified to be the key factor to judge whether or not an individual can complete a task successfully with his/her own capabilities. Self-efficacy can be achieved when the learner possess the confidence to perform certain tasks. Moreover, Bandura (1986) argued the beliefs of people's efficacy are a crucial influencing factor on how individuals determine whether they have sufficient capabilities to perform tasks or interpretations of experiences. In this study, self-efficacy is defined as a college student's self-confidence in his or her ability to learn via WBI systems.

Drawing on concepts from the interrelated literature streams including theory of reasoned action (TRA), technology acceptance model (TAM), and social cognition theory (SCT), this study develops a comprehensive model to aid in understanding college students' propensities towards the use of WBI. Accordingly, the related causal relationships among the underlying factors of the research model are hypothesized to guide the exploration of the influence level of each latent variable on college students' behavioral intentions to use the WBI platform. The research model is depicted as the following Figure 1.

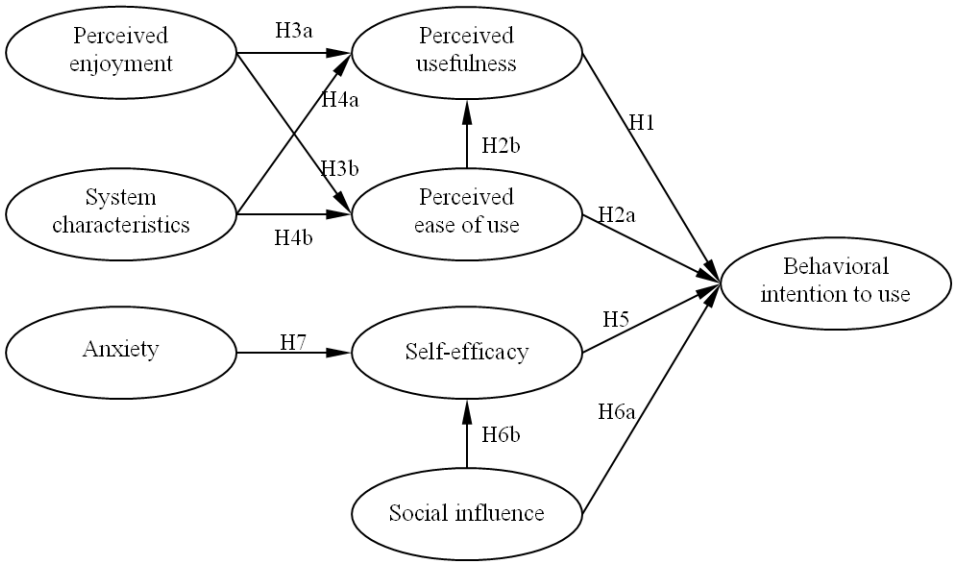

Figure 1: Research Framework

As Davis (1989) pointed out, the original TAM consists of perceived ease of use (PEOU), perceived usefulness (PU), attitude toward using (ATU), behavioral intention to use (BI), and actual system use (AU). PU and PEOU are the two most important determinants for system use. The ATU directly predicts users' BI which determines AU. Thus, people evaluate the consequences of their behavior in terms of PU and base their choice of behavior on desirability of the usefulness. Davis (1989) also suggested that PEOU might actually be a major independent factor to PU. TAM also postulates that PEOU is an important determinant of attitude toward using a system. It was then discovered that both PU and PEOU are important determinant of system usage.

In addition, many researchers also suggested that TAM needs to integrate with additional variables to provide an even stronger model in modeling adoption behavior (Legris et al. 2003). Davis et al. (1992) suggested that technology use intentions are predicted by PU and PEOU. Although the original formulation of TAM included attitude as a construct mediating the effects of beliefs on intentions, subsequently attitude was dropped from the specification of TAM (Agarwal & Karahanna, 2000). Venkatesh and Davis (2000) proposed an extended TAM, i.e. TAM2, which includes social influence processes and cognitive instrumental processes, whereas it omits ATU due to weak predictors of either BI or AU. Because TAM is used as the baseline model of this study, the hypothesized relationships in TAM are also verified in the context of WBI. Based on the foregoing discussions, the following hypotheses are proposed:
H1: Perceived Usefulness (PU) has a direct effect on Behavioral Intentions (BI) to use WBI systems.
H2a: Perceived Ease of Use (PEOU) has a direct effect on Behavioral Intentions (BI) to use WBI systems.
H2b: Perceived Ease of Use (PEOU) has a direct effect on Perceived Usefulness (PU).

Davis et al. (1992) found that people's intentions to use computers in the workplace can be affected by the degree of enjoyment they perceived in their experience of using the computers, which means that perceived enjoyment (PE) can fully mediate the effects on usage intentions. Liaw and Huang (2003) developed a conceptual model which integrated individual computer experience with perceptions to understand individual attitude toward search engines as a tool for retrieving information. The findings of this study indicated that PE has a positive effect on PU; in other words, the more the users perceived to be enjoyable in using search engines, the more they will perceive the usefulness of using search engines as tools for information searching.
Concerning the environment of WBI, in comparing a traditional training approach with a web-based training program, Venkatesh (1999) found that users who have more enjoyable experiences during training are more likely to perceive the system to be easier to use. In turn, the higher users perceived to be ease of use leads to

enhanced behavioral intention to use. Venkatesh (2000) further conceptualized perceived enjoyment as an antecedent of PEOU, whose effect increases over time as users gain more experience with the web-based system. However, the specific effect of PE on PEOU has been largely overlooked in a web-based context. Moon and Kim (2001) examined a conceptually similar but distinct construct, perceived playfulness, as an antecedent of WWW usage, suggesting a significant effect of perceived playfulness in determining the use of WBI systems. According to the survey conducted by Taylor and Gitsaki (2004), students reported that the use of the Web had made the course more enjoyable which results in their willingness of continuing to use the Web as learning tool to assist learning activities. Building upon the above research findings, the following hypotheses are proposed:
H3a: Perceived Enjoyment (PE) has a direct effect on Perceived Usefulness (PU).
H3b: Perceived Enjoyment (PE) has a direct effect on Perceived Ease of Use (PEOU).

The construct of system characteristics have been posited to directly influence users' perceptions on information systems (IS), since TAM was proposed by Davis et al. (1989). A variety of general IT system characteristics have been proposed and examined. According to Davis et al. (1989), system characteristics can directly influence users' perceptions on usefulness and ease of use concerning an information system. Subsequent research has validated the role of system characteristics in predicting user beliefs and technology acceptance in other contexts (Pituch and Lee, 2006). Investigators have echoed that there exists a significant relationship between system characteristics and measures concerning perceived usefulness. For example, in TAM related research (Ke et al., 2012; Venkatesh and Davis, 2000; Ramayah & Lee, 2012), system characteristics (SC) have been examined to be an external variable towards users' adoption of IT through the mediation of PU and PEOU. Davis (1993) suggested that system characteristics can be fully mediated by TAM model on usage behavior. Based on the prior research, the following hypotheses are thus formulated:
H4a: System Characteristics (SC) of WBI systems have direct effect on Perceived Usefulness (PU).
H4b: System Characteristics (SC) of WBI systems have direct effect on Perceived Ease of Use (PEOU).

Compeau and Higgins (1995) defined computer self-efficacy (SE) as one's beliefs about the ability to use computers effectively. In the study, self-efficacy is operationalized as "the confidence in one's ability to perform certain learning tasks using in web-based environment". Taylor and Todd (1995) suggested that self-efficacy has significant indirect influences on behavioral intentions. Compeau et al. (1999) developed a model to test the influence of computer self-efficacy on computer usage and the finding showed that self-efficacy has significant positive influence on use. In addition, prior works (Compeau et al., 1999; Isman & Celikli, 2009; Venkatesh, 2000) have also indicated that computer self-efficacy influences performance or behavior, including attitude and behavioral intention; and other studies have found that computer self-efficacy and perceived ease of use are related (Pituch & Lee, 2006). Ma and Liu (2005) found that Internet self-efficacy has a significant impact on behavioral intentions to use web-based electronic medical records. Based on the previous studies, the following hypothesis is proposed:
H5: Self-Efficacy (SE) has a direct effect on Behavioral Intentions (BI) to use WBI systems.

According to TRA, the direct effect of social influence to behavior intentions is attributed to individual's belief about one or more important referents would think he/she should perform certain behavior even though the behavior is not favorable for themselves (Ajzen & Fishbein, 1980). In addition, within the concept of SCT, self-efficacy is based on the reciprocal relationship between cognitive and behavioral concept which can be influenced by environmental factors, such as social pressure and peer influence (Bandura, 1986). Such influencing factors from an individual's reference group-the people to whom he/she looks to obtain guidance on behavioral expectations-can be expected to influence both self-efficacy and outcome expectations (Alenezi et al., 2010; Yang et al., 2011). Thus, learners might also need to acquire positive behavioral expectations from their friends, classmates and/or instructors to strengthen self-efficacy in a WBI environment. Moreover, Compeau and Higgins (1995) suggested that if the information from the reference group is credible, the social influence may also exert an influence on the behavioral intention to use the information technology. As a result, the individual's judgments about the likely consequences of the behavior will be affected. Based on the above discussion, the following hypotheses are proposed:
H6a: Social Influence (SI) has a direct effect on Behavioral Intentions (BI) to use WBI systems.
H6b: Social Influence (SI) has a direct effect on Self-Efficacy (SE).

In MIS related research, the findings concerning the influence of anxiety to system usage were mixed. Pare and Elam (1995) conducted a study regarding the adoption of personal computer and concluded that anxiety has a negative effect for user to utilize system software. Compeau et al. (1999) tested the influence of anxiety on computer usage and the result showed that there is no significant influence exists. In the WBI environment, students can benefit from the non-threatening environment to support their learning. In other words, the web-based instruction technology may provide students a more comfortable environment which would effectively

reduce negative effect, anxiety, and result in the confidence reinforced to improve their proficiency. In accord with SCT (Bandura, 1986), efficacy beliefs are the primary influence on behaviors. Thus, it makes logical sense to model anxiety as an antecedent to self-efficacy (Alenezi et al., 2010; Thatcher & Perrewe, 2002). Based on the prior literature, the following plausible hypothesis was proposed:
H7: Anxiety has a direct effect on Self-Efficacy (SE).

METHODOLOGY

A cross-sectional field survey was conducted with data collected from a vocational college in Taiwan. The empirical stage of this study was beginning from developing the relative constructs of student's intentions to use WBI and generate the relative measures as broad as possible. Then, an iterative interview process was applied for scales refinement. Next, the partial least squares (PLS) method, a component-based structural equation modeling technique, was applied to structure and validate the casual relationships between the underlying determinants (perceived enjoyment, system characteristics, and social influence), affection factor (anxiety), belief (perceive usefulness, ease of use, and self-efficacy), and the behavior intentions to use WBI systems. By considering the tangible expected outcomes of their perceptions and intentions, the researchers in this study expect to be able to assess the nomological and predictive validities of psychometric properties of these latent variables. The questionnaire included items worded with proper negation and a shuffle of the items to reduce monotony of questions measuring the same construct.

Previous research was reviewed to ensure that a comprehensive list of measures were included. Those for perceived usefulness (PU), perceived ease of use (PEOU), and behavioral intentions (BI) to use were adapted in our model from previous studies on TAM. The construct of system characteristics (SC) was derived from the prior work of Ke et al. (2012), Pituch and Lee (2006) and Ramayah and Lee, (2012). The scales for self-efficacy (SE) were based on the reserch of Compeau and Higgins (1995), Isman and Celikli (2009) and Thatcher and Perrewe (2002). The construct of social influence (SI) was adapted from Alenezi et al. (2010) and Yang et al. (2011). The measures for perceived enjoyment (PE) were captured using three items derived from Yi and Hwang (2003), and anxiety (ANX) were derived from Alenezi et al. (2010), Huang and Liaw (2005) and Thatcher and Perrewe (2002).

As mentioned above, the initial measurement item list of related constructs in questionnaire was generated from the previous literature review. Then, an iterative personal interview process (including faculties, teaching assistants, and representative students) was conducted to refine the instrument. These interviews enabled the researchers to gauge the clarity of the items presented in the survey instrument, to assess whether the instrument was capturing the desired phenomena, and to verify that important aspects had not been omitted. Changes were made and several iterations were conducted; the process was continued until no further modification was needed. Feedback served as a basis for correcting, refining and enhancing the experimental scales. Some scales were eliminated, because they were found to represent essentially the same aspects as others with only slight wording differences. Some scales were modified because the semantics appeared ambiguous or irrelevant to the perceived acceptance of the web-based instruction system of interest.

The finalized survey questionnaire consisted of three major parts. The first part recorded respondents' demographic information. The second recorded their perception on each variable of the research model in this study. The demographic variables assessed were respondents' gender, age, major, and experience of web usage. The third part asked each participant to indicate his or her degree of agreement on the scale items related to each of the constructs of research model. Data were collected using a seven-point Likert scales with the anchors 1 means strongly disagree; 4 is for neutral; and 7 indicate strongly agree, respectively.

This study was conducted in the vocational universities located in the southern part of Taiwan. Sample data was collected from the students in these universities. The subjects for this study were students who have the experience to use the WBI systems. Students who enrolled in courses supported by the WBI systems were coded and randomly selected from the administration affairs system of the targeted universities. These courses such as Introduction to management, Chinese, e-commerce, management information systems, English as foreign language learning are all compulsory for the students in the night school of this college. Totally, 1000 out of 1688 students enrolled in these courses were randomly selected. These courses are required as part of their undergraduate bachelors degree. Students taking the courses are of different majors including nursing, business management, IT and management information systems, healthcare management, and biotechnology.

The data was gathered by means of a self-administered questionnaire. These randomly selected students were self-administered the 34-item questionnaire after the final examination to ensure that they have actually used the WBI system. For each question, respondents were asked to circle the response which best described their level

of agreement. Because the participation of this study was voluntary, some of the randomly selected students disagreed to participate. Thus, the questionnaires were distributed to the ones who agreed to participate. Finally, a total of 258 questionnaires out of the 568 distributed were collected, giving response rate of 45 percent. Fifty-five participants gave incomplete answers and their results were dropped from the study. This left 218 sets of data with a 38 percent valid return rate. The profile of respondents is shown as in Table 1.

Table 1: The profile of respondents

Variable	Classification	Frequency	%
Gender	Male	86	48%
	Female	132	52%
Major	Nursing	61	28%
	Business management	66	30%
	IT/IS	39	18%
	Healthcare management	32	15%
	Biotechnology	20	9%
Learning Condition	Part time	152	70%
	Full time	66	30%
Experience of Web usage (Year)	Less than 1	29	13%
	1 to3	57	26%
	3 to 6	88	40%
	6 to 10	39	18%
	More than 10	5	2%
Average Age		21.79 Years	-

RESULTS

The statistical analysis strategy of this study involved a two-phase approach including the psychometric properties of all scales were first assessed through confirmatory factor analysis (CFA) and the structural relationships were validated by the bootstrap analysis. To ensure the phenomena captured, in this study, representing the constructs of the conceptual framework, the validity and reliability of the instrument were assessed by PLS method. PLS-Graph version 3.0 was applied for the statistical analysis. The assessment of item loadings, reliability, and discriminant validity is performed for the reflective constructs through a confirmatory factor analysis. Then, in the second phase, the structural model is assessed to confirm to what extent the causal relationships specified by the proposed conceptual framework are consistent with the available data.

For the assessment of measurement properties, the analytical process is performed in relation to the attributes of individual item reliability, construct reliability, average variance extracted (AVE), and discriminant validity of the indicators as measures of latent variables. The assessment of item loadings, reliability, convergent validity, and discriminant validity is performed for the latent constructs through a confirmatory factor analysis. Reflective items should be uni-dimensional in their representation of the latent variable, and therefore correlated with each other. Item loadings should be above .707, showing that more than half of the variance is captured by the constructs (Hair et al., 1998). In the measurement model of this study, all of the items developed and operationalized definitions of constructs are based on the review of refereed theories, relative literature and researches in related field. The experts in the disciplines of web-based instruction and e-learning were also invited to review all of the items of the instrument to reassure the content validity. The alpha-coefficients were used to represent for each of the constructs in the model proposed. In order to assure the confirmatory nature in the study, validity and reliability of the scales should be confirmed adequately. As shown in the following Table 2, all items have significant factor loadings above the threshold value, 0.707.

All constructs in the model exhibit good internal consistency as evidenced by their composite reliability scores. The composite reliability coefficients of all constructs in the proposed conceptual framework are adequate, ranging from 0.89 for the construct of social influence to .96 for behavioral intentions to use the WBI system. To assess discriminant validity (Chin, 1998), (1) indicators should load more strongly on their corresponding construct than on other constructs in the model and (2) the square root of the average variance extracted (AVE) should be larger than the inter-construct correlations. The percent of variance captured by a construct is given by its average variance extracted (AVE).

Table 2: Results for the Measurement Model

Construct	Scale item	Loading	Mean	SD
Perceived usefulness (PU)	PU1: Using the WBI system would enhance my effectiveness in learning.	0.84	4.53	0.99
	PU2: Using the WBI system in the course would increase my learning productivity.	0.88	4.46	1.01
	PU3: Using the WBI system would improve my learning performance in the course.	0.89	4.51	1.15
	PU4: Using this WBI system would enable me to accomplish learning more quickly.	0.88	4.50	1.08
	PU5: I find the WBI system is useful in the course.	0.84	4.61	1.13
Perceived ease of use (PEOU)	PEOU1: Learning to operate the WBI system was easy for me.	0.80	4.78	1.17
	PEOU2: I find it was easy to get the WBI system to do whatever I want.	0.86	4.40	1.12
	PEOU3: It was easy for me to become skillful at using the WBI system.	0.84	4.33	1.08
	PEOU4: My interaction with the WBI system was clear and understandable.	0.87	4.60	1.16
	PEOU5: I find the WBI system was easy to use.	0.86	4.66	1.11
Perceived enjoyment (PE)	PE1: I find using the WBI system enjoyable.	0.95	4.51	1.21
	PE2: The actual process of using the WBI system to learn the course is pleasant.	0.95	4.55	1.24
	PE3: I have fun using the WBI system to learn the course.	0.94	4.55	1.20
System characteristics (SC)	SC1: The WBI system enables interactive communications among students and between instructor and students.	0.84	4.80	1.11
	SC2: The communication tools in the WBI system are effective (email, chat room, etc.).	0.87	4.86	1.03
	SC3: The WBI system allows me to control over my learning activities.	0.87	4.92	1.12
	SC4: The WBI system offers flexibility in learning as to time and place.	0.86	5.01	1.14
	SC5: The WBI system allows me to practice repeatedly.	0.85	4.84	1.04
	SC6: The WBI system enables repeated exposure to the target learning tasks.	0.85	4.94	1.09
Social influence (SI)	SI1: My friend would think that I should use the WBI system.	0.87	4.39	1.16
	SI2: My classmates would think that I should use the WBI system.	0.87	4.42	1.16
	SI3: My teachers would think that I should use the WBI system.	0.80	4.85	1.31
	SI4: I will have to use the WBI system because my teachers require it.	0.82	4.63	1.33
Anxiety (ANX)	ANX1: I feel apprehensive about using the WBI system to learn The course.	0.84	3.67	1.32
	ANX 2: It scares me to think that I could cause mistakes I cannot correct by hitting the wrong key or operating inappropriately when using the WBI system.	0.93	3.71	1.40
	ANX 3: Using the WBI system is somewhat intimidating to me.	0.88	3.84	1.31
	ANX 4: Connecting speed of the Internet affects my willingness to use the WBI system.	0.81	3.95	1.36
Self-efficacy (SE)	SE1: I am confident of using the WBI system even if there is no one to show me how to do it.	0.90	4.28	1.28
	SE2: I am confident of using the WBI system even if I have only the instructions for reference.	0.89	4.45	1.18
	SE3: I am confident of using the WBI system even if I have never used such a system before.	0.88	4.29	1.13
	SE4: I am confident of using the WBI system as I have just seen someone using it before.	0.87	4.54	1.23
Behavioral intention to use (BI)	BI1: Assuming that I have the chance to take the course, I intend to use the WBI system to learn.	0.95	4.58	1.35
	BI2: I intend to use the WBI system to learn the course frequently.	0.96	4.70	1.33
	BI3: I intend to take full advantage of the WBI system to learn the course.	0.92	4.53	1.39

To show discriminant validity, each construct square root of the AVE has to be larger than its correlation with other factors. As the results shown in the following Table 3, all constructs meet this requirement. Finally, the values for reliability are all above the suggested minimum of 0.7 (Hair et al., 1998). Thus, all constructs display adequate reliability and discriminant validity. All constructs share more variance with their indicators than with other constructs. Thus, the convergent and discriminant validity of all constructs in the proposed conceptual framework can be firmly assured.

Table 3: Inter-Correlation among Constructs.

Construct	# of Items	Construct							
		PU	PEOU	SC	SE	ANX	PE	SI	BI
PU	5	0.87*	0.56	0.63	0.53	-0.20	0.68	0.50	0.65
PEOU	5		0.85	0.64	0.75	-0.23	0.56	0.64	0.62
SC	6			0.87	0.63	-0.24	0.65	0.60	0.67
SE	4				0.89	-0.28	0.63	0.62	0.64
ANX	4					0.86	-0.26	-0.21	-0.27
PE	3						0.95	0.54	0.80
SI	4							0.85	0.54
BI	3								0.94
Composite Reliability		0.94	0.93	0.94	0.94	0.92	0.96	0.89	0.96

*Diagonal elements are the square roots of average variance explained (AVE).

In the second phase, the structural model is assessed to confirm to what extent the causal relationships specified by the proposed conceptual framework are consistent with the available data. The PLS method does not directly provide significance tests and confidence interval estimates of path coefficients in the conceptual framework. In order to estimate the significance of path coefficients, a bootstrapping technique was used. Bootstrap analysis was done with 200 subsamples and path coefficients were re-estimated using each of these samples. The vector of parameter estimates was used to compute parameter means, standard errors, significance of path coefficients, indicator loadings, and indicator weights. This approach is consistent with recommended practices for estimating significance of path coefficients and indicator loadings and has been used in prior IS studies.

Hypotheses testing will be performed by examining the size, the sign, and the significance of the path coefficients and the weights of the dimensions of the constructs, respectively. The estimated path coefficient and its associated significance level were examined. The statistical significance of weights can be used to determine the relative importance of indicators in forming a latent construct. One indicator of the predictive power of path models is to examine the explained variance or R^2 values. R^2 values are interpreted in the same manner as those obtained from multiple regression analysis. They indicate the amount of variance in the construct that is explained by the path model (Barclay et al. 1995). The magnitude and significance of these path coefficients provides further evidence in support of the nomological validity of the research model.

The path coefficients and explained variances for the proposed model in this study are shown in Figure 2. Factor loadings of indicators of all constructs can be read between the lines as loadings in a principal components factor analysis. T-statistics and standard errors were generated by applying the bootstrapping procedure. All of the constructs in this study were modeled as reflective and most of the constructs in the model were measured using multiple indicators, rather than summated scales. Perceived usefulness, perceived ease of use, self-efficacy, and social influence account for 56% of the variance explained in behavioral intentions to use WBI systems. Perceived enjoyment, system characteristics, and perceived ease of use together explain 55% of the variance in perceived usefulness, while perceived enjoyment and system characteristics explain 45% of the variance in perceived ease of use. The construct of self-efficacy was contributed by social influence and anxiety with the explained variance of 44%. An F test is applied to test the significance of the effect size for the model as it explains all dependant variable are significant (p=.000). Therefore, overall, the model has strong explanatory power for the construct of “behavioral intentions to use WBI”. The significant path coefficients, effect size, and the value of the R2 all provide supports for the proposed conceptual framework.

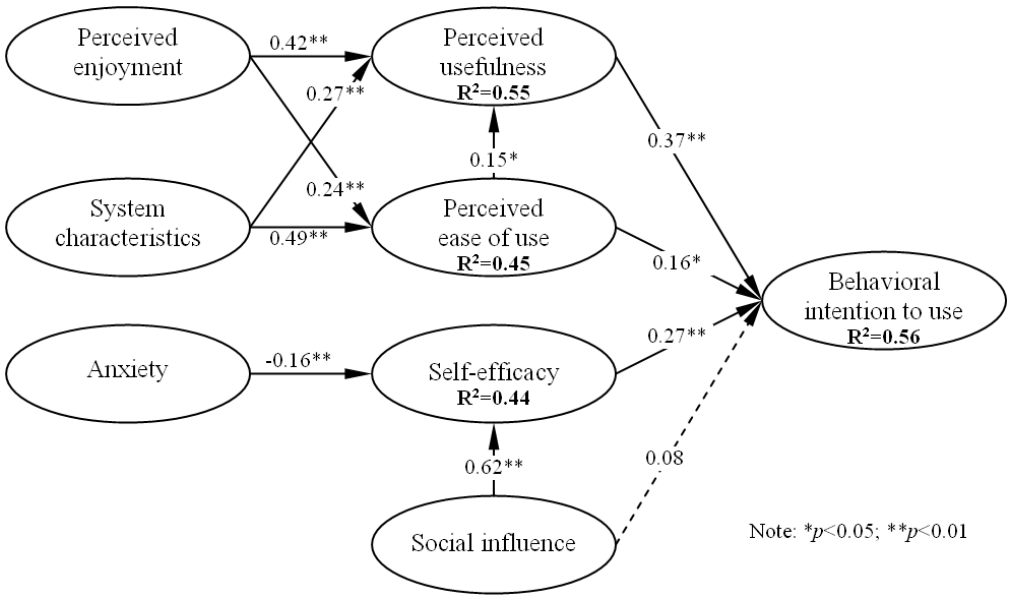

Figure 2: PLS analysis results

DISCUSSIONS AND CONCLUSION

The aim of this study is to exploring what factors influence college students' behavioral intentions to utilize web-based instruction (WBI) systems and, accordingly, to develop a comprehensive model to predict their intentions to use such systems. The empirical results of PLS analysis provide strong supports for the proposed Hypotheses H1, H2a, and H2b effectively drawn from the measurement of the TAM. This finding is consistent with that obtained by Davis et al. (1989). Hypotheses H3a, H3b, H4a, and H4b are also firmly supported by the significant path coefficients. That is the underlying determinants, PE and SC, would apparently influence student's perceptions on the usefulness and ease of use of the WBI system. System developers might have to collaborate with instructors to design and implement a WBI system with good interaction, flexibility, friendly interface, and a joyful learning cyberspace to facilitate student's willingness to use WBI. Contrary to our predictions, the path from SI to BI (H6a) is not significant. The interesting findings are worth of pursuing in our future study to clarify the insignificant predicting effect of SI to BI and the strong effect to SE as a mediator with respect to BI. Besides, hypotheses H5, H6b, and H7 are also strongly supported: SE has significant effects on BI (H5); and the constructs of SI and ANX are significant external predictors for SE (H6b and H7). These results suggest that college/university staffs (program directors and instructors) might then have to take more time and efforts to preach peer collaborative practices, help students lower the anxiety, and effectively cultivate their self-confidence to use WBI systems.

The importance of web-based instruction to education has increased considerably over the past few years. In order for the successes and effective implementations of WBI systems, it is vital for researchers to cumulate efforts from the continuations of rigorous scientific approaches, educational theories, and well-targeted procedures and techniques in the web-based instruction research fields. This empirical study was motivated by a broad interest in understanding student's behavior intentions toward the usage of web-based instruction systems. Before considering the implications it is important to acknowledge the limitations of this study. First, the sample has a bias toward the data source gathered from the respondents in only one college, which may not represent the opinions in other colleges and/or university in Taiwan. Second, the research was conducted in Taiwan, the findings in the study might not hold true in other countries. Thus, the valid instrument was developed using the large sample gathered from only one vocational college in Taiwan, a confirmatory analysis and cross-cultural validation using another large sample gathered elsewhere is required for improving the generalizablity of the instrument. Hence, other samples from different areas or nations should be gathered to confirm and refine, the factor structure of the instrument, and to assess its reliability and validity. These issues are worth of further pursuance in our future study.

Drawn from the empirically results, this study provide interesting insights into the applicability of some of the relative constructs, with respect to explaining cognitions, motivations, belief, and intentions of students in using the WBI system. The research findings suggested general adequacy and applicability of the proposed conceptual framework in the WBI settings. In addition, this study employed a rigorous scale development procedure to establish an instrument to weigh up student's behavioral intentions to use web-based instruction systems. Web-

based instruction program directors, system developers and instructors can make the best of this WBI instrument for understanding of student's inclinations and take necessary corrective actions to improve. Besides making an overall assessment, the instrument can be adapted to compare student's perceptions and intentions for different web-based instruction systems with specific factors (i.e. learner interface, learning community, content, and personalization). The proposed conceptual framework might also be tailored to counterpart the specific research or practical needs of specific computer aided instruction (CAI) environment. The generality of the results can also serve as a useful refereed basis for the comparative analyses in the future. The contributions of this study include:

1. Integrating prior works concerning web-based instruction based on TRA, TAM and SCT.
2. Identifying the relative cognition, and belief constructs that will significantly influence student's behavioral intentions to use WBI.
3. Establishing a new model for measuring user's cognitions, belief, and intentions to use WBI.
4. Justifying the influence levels of underlying determinants for the intentions to use WBI.
5. Providing a useful instrument for web-based instruction system developer and instructors on planning and implementing WBI systems.

In conclusion, the main theme in this paper was to enrich our understanding of student's behavioral intentions toward web-based instruction system usage. Given the undeniable reality that IT is ubiquitous in all sorts of educational contexts, such research has value for theory development as well as for practice. Future research, in different samples and longitudinal studies, are necessary. The validity of a measure cannot be truly established on the basis of a single study. Measure validation requires the assessment of the measurement properties over a variety of samples in similar and different contexts. In the future, an instrument for measuring student's intentions to use a synchronous web-based instruction system should also be developed. More attention also can be directed toward understanding the antecedents and consequents of other web-based instruction systems.

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