Factors Contributing Pre-School Trainees Teachers Adoption of Virtual Learning Environment: Malaysian Evidence

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ABSTRACT
Virtual Learning Environment (VLE) has become the main mechanism in supporting on-line education either in primary or secondary school. Although VLE efforts are considered to be a significant corporate investment, many surveys indicate high drop-out rates or failures. This research uses an integrated model in order to assessing the influence of IS-oriented, psychological and behavioral factors on instructors' adoption of virtual learning systems. Survey data collected from 76 pre-school teachers were analyzed using structural equation modeling to examine the theoretical model. The research results show that, perceived ease of use and compatibility increase pre-school teachers intention to use virtual learning systems; however, perceived ease of use is the most important factor affecting on intention and actual use of the system (adoption).

Keywords: Virtual Learning Environment, Intention to use, Partial Least Square, Unified Theory Of Acceptance and Use Of Technology (UTAUT), Technology Acceptance Model (TAM) and Compatibility

INTRODUCTION
The move from a product-based economy to a knowledge-based economy results in an better demand for knowledge workers (Lai, Wang, & Chou, 2009; Ong & Lai, 2007; Ong, Lai, & Wang, 2004), so that education institutions with limited facilities are not able to fulfill this need. Therefore, beside traditional training, they have turned to offer electronic courses. Education institutes and companies have devoted great efforts and large sum of money to develop e-learning programs for users. Surveys conducted by the Ministry of Education in 2010 found that the use of ICT in school is limited. Approximately 80% of teachers use ICT less than one hour per week. Only a third of students stated their teachers regularly use ICT. Ministry of Education Malaysia (2012) in the preliminary report of Malaysia Education Blueprint 2013-2025 said that there was no evidence to suggest that ICT is used to promote skills such as creativity, problem solving, and critical thinking. Furthermore, although e-learning efforts are considered to be a significant corporate investment, many surveys show high drop-out rates or failures (Motaghian, Hassanzadeh, & Moghadam, 2013). Numerous learning institution that offer e-learning face massive difficulty in achieving successful strategies, including the delivery, effectiveness, and acceptance of the courses (Motaghian, et al., 2013). Especially, despite the emerging trend of using various types of e-learning systems to facilitate teaching and learning activities, the number of e-learning users is not increasing as fast as predicted such as the use of web based learning (Motaghian, et al., 2013). In the end, while e-learning has been promoted to various levels of users, the intention to adopt such system is still very low. Although both teachers and students are the primary users of VLE systems, teachers play the most important role in shaping the success or failure of the systems (Motaghian, et al., 2013). If instructors decide to conduct all or part of their teaching activities through a web-based learning system, students have no choice but to use the system (Motaghian, et al., 2013; W.-T. Wang & Wang, 2009). Therefore, it is important to identify the factors that influence teachers adoption of VLE systems to help policymakers on improving the implementation of VLE in Malaysian primary school.

VIRTUAL LEARNING ENVIRONMENT SYSTEMS
Virtual learning system (VLS) is an information system that facilitates e-learning have been widely implemented by education institutions to support face-to-face teaching and self managed learning in the virtual learning and

education environment (W.-S. Lin, 2012). Virtual reality enables a learning environment in cyberspace that is more versatile than the traditional ‘‘chalk-and-blackboard’’ classrooms in that learning takes place as individuals make exchanges of technological interactions either with other individuals or with whatever systems/software used; the application of virtual reality in education is a great leap of teaching methods after the multimedia, computers, and the Internet (Jou & Wang, 2013). 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 (W.-S. Lin, 2012). In their studies, Jou & Wang (2013) reported that after assessing the technical skills that have been developed for the time period of one semester, the students have reported VLE to be a significantly effective method when considering the three dimensions of ‘‘operation of machines’’, ‘‘selection of process parameter’’, and ‘‘process planning”. The findings therefore proves the benefit of VLE on student learning performance.

TECHNOLOGY ACCEPTANCE MODEL

TAM as a theoretical extension of TRA was first introduced by Davis (1989). TRA is a well-known model in the social psychology domain, which suggests that a person’s behavior is determined by the individual’s intention to perform the behavior and that this intention is, in turn, a function of his/her attitude toward the behavior and his/ her subjective norm (Roca, Chiu, & Martínez, 2006). Attitudes toward the behavior describe the positive or negative feelings toward a specific behavior, and subjective norm assesses the social pressures on the individual to perform or not to perform a behavior (Roca, et al., 2006). TAM adapted from TRA proposes that two particular beliefs, perceived usefulness and perceived ease of use, are the primary drivers for technology acceptance. Perceived usefulness is defined as the degree to which a person believes that using a particular system would enhance his/ her job performance, and perceived ease of use is defined as the degree to which a person believes that using a particular system would be free of physical and mental effort (Davis, 1989). Further, perceived usefulness and perceived ease of use both affect a person’s attitude toward using the system, and consistent with TRA, these attitudes toward using the system determine behavioral intentions, which in turn lead to actual system use. There are numerous studies using TAM and its extended version in explaining user acceptance (Chen & Chao, 2011; Cheung & Vogel, 2013; Chow, Herold, Choo, & Chan, 2012; Hernandez, Jimenez, & Martin, 2009; Jeong, 2011; W. Lee, Xiong, & Hu, 2012; Y.-C. Lee, Li, Yen, & Huang, 2010; F. Lin, Fofanah, & Liang, 2011; Pan & Jordan-Marsh, 2010; Sanchez-Franco, 2010; Teo, Lee, Chai, & Wong, 2009; Yen, Wu, Cheng, & Huang, 2010)

UNIFIED THEORY OF ACCEPTANCE AND USE OF TECHNOLOGY (UTAUT)

The UTAUT model integrates the fragmented theory and research on individual acceptance of information technology. The theory was formulated, with four core determinants of intention and usage, and up to four moderators of key relationships. UTAUT provides a useful tool for managers needing to. The UTAUT is able to achieve 70% of the variance (adjusted R^2) in usage intention which is rarely found in social science research. Venkatesh et al. (2003) stated that UTAUT is a definitive model that synthesizes what is known and provides a foundation to guide future research in user acceptance area. By encompassing the combined explanatory power of the individual models and key moderating effect, UTAUT advances cumulative theory while retaining a parsimonious structure. Four constructs were recognized as direct determinants of user acceptance and usage behavior: (1) performance expectancy, (2) effort expectancy, (3) social influence, and (4) facilitating conditions

Since its inception in 2003, researchers have increasingly turned to testing UTAUT to explain technology adoption. It was tested and applied to several technologies, such as e-learning (Bakar, Razak, & Abdullah, 2013), social media (Gruzd, Staves, & Wilk, 2012) on-line family dispute resolution services (Casey & Wilson-Evered, 2012), mobile banking (Zhou, Lu, & Wang, 2010), health information technology (Kijsanayotin, Pannarunothai, & Speedie, 2009), online purchasing (San Martín & Herrero, 2012), mobile commerce (Chong, 2013; Min, Ji, & Qu, 2008) information kiosks (Y.-S. Wang & Shih, 2009), e-government (Weerakkody, El-Haddadeh, Al-Sobhi, Shareef, & Dwivedi, 2013), mobile wallet (Shin, 2009).

THEORETICAL FRAMEWORK AND HYPOTHESIS DEVELOPMENT

Although the TAM and UTAUT is applicable to various technologies, constructs in the TAM and UTAUT must be extended by incorporating additional factors. These additional factors depend on the target technology, users, and the context (Motaghian, et al., 2013; Shyu & Huang, 2011). The hypotheses are explained as follows.

PERCEIVED USEFULNESS

Previous studies have emphasized the role of the perceived usefulness on intention to use (Kuo & Yen, 2009; Terzis, Moridis, & Economides, 2012). Davis (1989) argued that individuals tend to undertake behaviors they believe will help them perform their job better and more efficiently. When teachers consider VLE system useful, the likelihood to use the system are stronger. Hence, the following hypothesis is developed:

H1. Perceived usefulness will have a significant influence on intention to use VLE system

PERCEIVED EASE OF USE

Perceived Ease of Use (PEOU) is defined as the degree to which a person believes that using the system would be free of effort (Davis, 1989). Previous research has shown that the perceived ease of use is expected to influence directly perceived usefulness and behavioral intention to use (Terzis & Economides, 2011; Tung & Chang, 2008). Hence, the following hypothesis is developed:

H2. Perceived ease of use will have a significant influence on intention to use VLE system

SOCIAL INFLUENCE

Social influence is to the degree to which an individual perceives that important others believe he or she should use a technology (Chiu & Wang, 2008). The concept is similar to subjective norm in theory of planned behavior (TPB) which argued that the more favorable the social influence of a behavior, the stronger would be an individual's intention to perform it. According to innovation diffusion theory (IDT) (Chiu & Wang, 2008), users tend to increase communication with others to interpret their IT adoption. Such increased interactions can influence adoption decision. Studies have showed that subjective norm is a significant predictor of intention to use a system (Chiu & Wang, 2008; Yang, Lu, Gupta, Cao, & Zhang, 2012). Accordingly, the following hypothesis was proposed.

H3. Social Influence will have a significant influence on intention to use VLE system

FACILITATING CONDITION

Factors and resources that an individual believes exist to support his or her activities are termed facilitating conditions (Chiu & Wang, 2008). Previous studies have emphasized the role of facilitating condition on intention to use (Chang & Cheung, 2001; Chiu & Wang, 2008; Teo, 2011). Accordingly, the following hypothesis was proposed.

H4. Facilitating condition will have a significant influence on intention to use VLE system

COMPATIBILITY

Compatibility is the degree to which an innovation is perceived to be consistent with the potential users' existing values, previous experiences, and needs. Greater compatibility generally results in a faster rate of system adoption (Tung & Chang, 2008). Prior literature has investigated compatibility as a significant predictor of intention to use (Liao & Lu, 2008; Tung & Chang, 2008). Thus, the following hypothesis was proposed.

H5. Compatibility will have a significant influence on intention to use VLE system

METHODOLOGY

The data were collected at a major teacher training college located in east coast of Malaysia. At this training college (the number of trainees teacher is about 800 and they will be using VLE system in near future and some of them already used it in a short time). We have provided a brief description of the VLE system before answering the questionnaires so that they get appropriate and sufficient information regarding VLE features and benefit.

In total, 76 trainees teacher completed the survey. We considered only fully completed questionnaires for further analysis. No particular sign was present on the questionnaire, thus guaranteeing perfect anonymity. The survey was designed to gather information about intention to use VLE system. The items used in the questionnaire were validated and come from the existing literatures.

Questionnaire was used as data gathering instrument in this research. The questionnaire is in five-point Likert scale ranging from strongly disagree (1) to strongly agree (5) and consists of 21 items which are related to the six constructs of the research model. The confirmatory factor analysis (CFA) should be done before the structural equation model is examined and the exploratory factor analysis is not necessary for the current study as the instrument of the current research is adapted from previous studies and it has been shown to be a valid instrument in predicting the user's intention to use new information system.

The research model was analyzed using SmartPLS software which is a partial least squares (PLS) structural equation modeling (SEM) tool. We chose PLS for the data analysis since, compared to covariance-based approaches, it is advantageous when the research model is relatively complex and has a large numbers of indicators, the measures are not well established, and/or the relationships between the indicators and latent variables have to be modeled in different modes (i.e. formative and reflective measures) (Fornell & Bookstein, 1982; Motaghian, et al., 2013).

MEASUREMENT MODEL

Analysis of the measurement model within PLS involves examining the item reliability, convergent validity, and discriminant validity (Fornell & Larcker, 1981). The measurement model was assessed in terms of: individual item loadings, reliability of measures, convergent validity and discriminant validity. All items loaded significantly on their latent construct ($p < 0.05$) and exceeded the minimum threshold of 0.4 recommended by Hulland (1999). Reliability was assessed using composite reliability and Cronbach's alpha. All multi-item constructs met the guidelines for composite reliability greater than 0.70 (Hair et al., 2006) and Cronbach's alpha greater than 0.70 (Nunally & Bernstein, 1994). Convergent validity was assessed using average variance extracted. All multi-item constructs met the guideline of average variance extracted greater than 0.50 (Hair et al., 2006). For satisfactory discriminant validity each item should load more highly on its own construct than on other constructs (McGill & Klobas, 2009). In addition, the average variance shared between a construct and its measures should be greater than the variance shared by the construct and any other constructs in the model (Chin, 1998). Table 1 provides a summary of the reliability and convergent validity of the final scales used in the study. Table 2 provides the construct inter-correlations and the square root of average variance extracted for each construct (in bold on the diagonal). In all cases the square root of average variance extracted exceeds the corresponding construct inter-correlations thereby demonstrating discriminant validity (Chin, 1998).

Table 1 Summary of measurement scales

Construct	AVE	Composite Reliability	Cronbachs Alpha
com	0.76	0.93	0.89
eou	0.80	0.92	0.87
fc	0.73	0.89	0.82
it	0.75	0.92	0.89
pu	0.83	0.95	0.93
si	0.85	0.95	0.91

Table 2 Discriminant validity

Construct	com	eou	fc	it	pu	si
com	**0.87**					
eou	0.65	**0.89**				
fc	0.48	0.43	**0.85**			
it	0.76	0.79	0.47	**0.86**		
pu	0.74	0.74	0.51	0.76	**0.91**	
si	0.72	0.63	0.56	0.68	0.72	**0.92**

STRUCTURAL MODEL

Two criteria were used to assess structural model quality: the statistical significance of estimated model coefficients and the ability of the model to explain the variance in the dependent variables. The bootstrapping technique implemented in SmartPLS 2.0 was used to evaluate the significance of these hypothesized relationships. The R^2 of the structural equations for the dependent variables provides an estimate of variance explained (Hair et al., 2006), and therefore an indication of the success of the model in explaining these variables.

RESULTS

A total of 76 teacher trainees (80.3% females and 19.7% males) participated in the study. Teacher trainees ages ranged from a minimum of 18 to a maximum of 25. They had one to three years of experience in using computers. The majority of respondents had certificate or diploma. Figure 1 shows the standardized coefficients for each hypothesized path in the model and the R^2 for each dependent variable. Two of the five hypotheses were supported. Perceived ease of use had a significant positive effect on intention to use of VLE system, thus hypotheses H2 were supported. Contrary to expectations, perceived usefulness did not influence intention to use VLE system, therefore hypothesis H1 was not supported. As hypothesized, the influence of compatibility towards intention to use VLE had a significant positive impact. Therefore hypothesis H5 was supported. Social influence was not found to influence intention to use VLE in this study, thus hypothesis H3 was not supported. Facilitating conditions was not found to influence intention to use of VLE system and as a result, hypothesis H4 was not supported. The capability of the model to explain the variance in the dependent variables was the second criterion used to evaluate the model. The R^2 values are measures of the capability of the model to explain the

variance in the dependent variables and are reported in Figure 1. The model explained 75% of the variability in intention to use VLE.

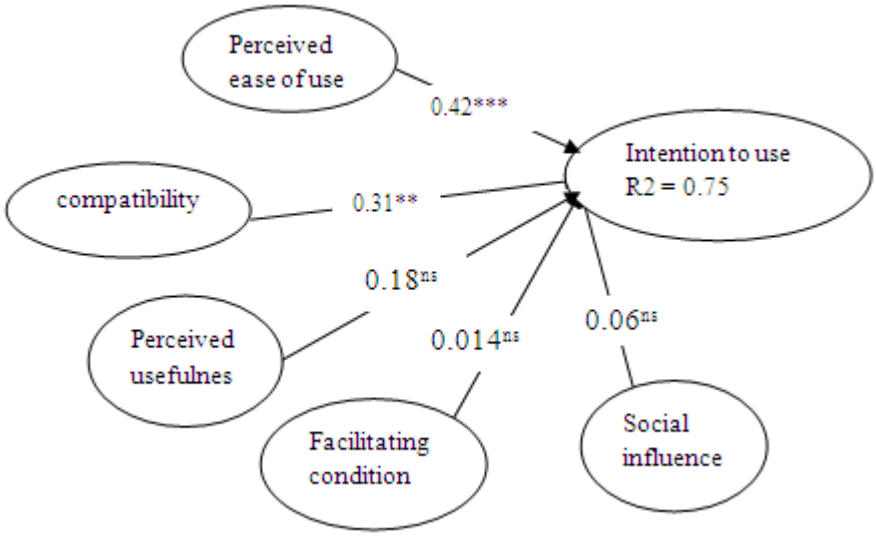

Figure 1: Structural model result

DISCUSSION AND IMPLICATION

This study found that both factors are positively associated with intention to use VLE. Perceived ease of use was identified in this study as a primary determinant of intention to use. The link between perceived ease of use and intention to use has previously been validated in e-learning acceptance research (Roca & Gagné, 2008) and result of current studies was consistence with previous one. We also found that compatibility affects intention and it is also consistence with Tung & Chang (2008).

Our study contributed to an overall conceptual understanding of the nature and the importance of components of TAM, UTAUT and compatibility as determinants in VLE adoption. Our findings also suggested that perceived ease of use was the strongest predictor of an individual's intention to use VLE system. For the policy impact, the ministry of higher education thus should consider providing teachers with the system that will be used regularly and gain benefit on their teaching and learning activities.

LIMITATIONS

The study had several limitations. First, data for this study was collected through survey, therefore, allowing a potential self report bias from respondents. Second, because the data for all the model variables came from single respondents in a one-time survey, common method variance might influence some postulated relations in the path model. Future research should address this issue.

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