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Understanding Student Teachers' Behavioural Intention to Use Technology: Technology Acceptance Model (TAM) Validation and Testing

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This study sets out to validate and test the Technology Acceptance Model (TAM) in the context of Malaysian student teachers' integration of their technology in teaching and learning. To establish factorial validity, data collected from 302 respondents were tested against the TAM using confirmatory factor analysis (CFA), and structural equation modelling (SEM) was used for model comparison and hypotheses testing. The goodness-of-fit test of the analysis shows partial support of the applicability of the TAM in a Malaysian context. Overall, the TAM accounted for 37.3% of the variance in intention to use technology among student teachers and of the five hypotheses formulated, four are supported. Perceived usefulness is a significant influence on attitude towards computer use and behavioural intention. Perceived ease of use significantly influences perceived usefulness, and finally, behavioural intention is found to be influenced by attitude towards computer use. The findings of this research contribute to the literature by validating the TAM in the Malaysian context and provide several prominent implications for the research and practice of technology integration development.

Key Words: Technology Acceptance Model, Computer Use, Student Teachers, Behavioural Intention, Use Technology

INTRODUCTION

In the technological trends of the 21st century, all member countries of the South East Asia Ministers of Education Organization (SEAMEO), including Malaysia, have begun to focus on the benefits of information and communications technology (ICT) to improve teaching and learning. Malaysian schools have devoted considerable resources to ICT. They have included computer technology as an integral part of students' learning experiences and as a way to equip them with the skills and knowledge necessary to succeed in the 21st century. The Ministry of Education (MOE) has expressed the need to use technology in creating classroom-to-classroom connections via the internet as a way to build cultural awareness and foster studying habits. The MOE has also noted that public schools have the responsibility to produce technology-literate citizens who are prepared to excel in an information- based society (Wong, Goh, Hafizul & Rosma, 2010). They emphasised that the public education system, either the primary or the secondary schools, must ensure that all students have equal access to computer-based technology support for their academic success, regardless of their social or economic status. The push to incorporate and integrate technology in classroom teaching from all levels became much stronger and vital in the Malaysian education system after the introduction of the Smart School.

The Smart School is one of the main thrusts of the Multimedia Super Corridor (MSC) which began its operations in 1997 (Ministry of Education, 1997). The MOE launched a National Education Blueprint in 2006 to ensure all schools in the country would become a 'smart school' (Ministry of Education, 2006). To realise its intention, the Malaysian government invested millions of Ringgit to train pre-service and student teachers with the necessary computer skills and knowledge, and to equip these teachers with the right attitude to ensure a high acceptance of technology use (Wong et al., 2010).

The acceptance of technologies in teaching and learning among student teachers has been a subject of many studies in the past decades. The issue related to student teachers' behavioural intention has recently attracted similar attention. Numerous researchers have stated that the role of student teachers in the process of implementing computers in the classrooms has been crucial (e.g., Chen, 2010; Park, 2009; Teo & van Schaik, 2009; Wong & Teo, 2009). Furthermore, many survey studies in developed countries have shown that adding technologies into the education process does not simplify teaching and learning activities; instead the adoption of computers in teaching is a complex innovation with many obstacles such as high levels of resistance to change among teachers and involving new technological-pedagogical practices. The technology enhances pedagogy only if the teachers understand it as another pedagogical means to achieve teaching and learning goals. The other barrier which has been shown to impede the full adoption of using technology in teaching is the student teachers' attitude towards technology (Teo, 2011). Attitude among student teachers have been shown to be an important determinant in the successful integration of technology in teaching and learning in their teaching practices (Teo, 2009, Teo & van Schaik, 2009).

In this regard, the groundwork must be laid to identify student teacher's behavioural intention to use technology in teaching and learning.

Many technology acceptance models, such as the Technology Acceptance Model (TAM) (Davis, 1989), the Theory of Reasoned Action (TRA) (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) and the Theory of Planned Behavior (TPB) (Ajzen, 1985), have been developed in an attempt to explore and understand an individual's attitude towards and intention to adopt a specific technology. Among those models, the TAM is considered an influential technology acceptance model for explaining behavioural intention (Figure 1). Various researchers have adopted and expanded this model to show its validity for use (Teo & Noyes, 2011; Venkatesh, 2000; Venkatesh & Davis et al., 2000). Unfortunately, the TAM has not been extensively tested outside of developed countries, particularly not within Asian countries (Teo, Wong, & Chai, 2008). Consequently, Teo (2010) noted the importance of further validating the model in different cultures so as to strengthen its cultural validity. Furthermore, many validations of the TAM have been carried out in non-educational contexts and this limits its application in educational settings.

That said, there are only a few studies that have utilised the TAM in exploring Malaysian student teachers' intention of technology integration in teaching and learning (Teo, et al. 2008; Wong & Teo, 2009). Therefore, the time has come to conduct additional testing to provide further evidence to determine the applicability and robustness of the TAM, but in a Malaysian context. The results of this study may provide insights into the factors that influence technology acceptance among Malaysian student teachers. Knowing and understanding technology acceptance will enable policymakers and teacher educators better design teaching curriculum which can help enhance the use of computers in teaching and learning among student teachers and in-service teachers in the future.

Given the critical impact of student teachers' behavioural intention and the contributions that they make in supporting or inhibiting the integration of computer technology in the classroom, a call for an examination into the factors influencing its acceptance becomes crucial. Hence, this administers the TAM to a sample of Malaysian student teachers. The results of this study may, foremost, further clarify issues related to the validation and adaptability of the TAM in the Malaysian student teachers' context, and provide insights into technology acceptance factors among student teachers and.

THEORETICAL FRAMEWORK AND HYPOTHESES

Determinants of Technology Acceptance Model (TAM)

Various theoretical models have emerged to explore and explain factors that cause individuals to accept, reject or continue the use of new technology (Ajzen, 1985; Ajzen & Fishbein, 1980; Venkatesh & Davis, 2000; Venkatesh, Morris, Davis & Davis, 2003). Rooted in the work of Ajzen and Fishbein' model, Theory of Reasoned Action (TRA), Davis et al. (1989) introduced and developed the Technology Acceptance Model (TAM), and provided a theoretical context that could explain the relationship of attitudes-intention-behavior (Figure 1). The TAM received empirical support for being robust and parsimonious in predicting technology acceptance and adoption. The TAM explained that a person's performance of specified behaviour was determined by his or her behavioural intention to perform certain tasks. There were two specific variables, perceived usefulness and perceived ease of use, which were hypothesised to be the fundamental determinants of a user's acceptance.

Perceived usefulness

Perceived usefulness is defined as the degree to which a person believes that using a particular technology will enhance his or her job performance (Davis et al., 1989). People tend to use or not to use an application to the extent that they believe it will enhance their job performance. Perceived ease of use is considered the extent to which a person believes that using the system will be free of effort (Davis, 1989). It is possible that people who believe that the technology to be useful, could, at the same time believe it to be too difficult to use and that the performance benefits of usage are outweighed by the effort of using the entire application or technology (Davis, 1989). Teo and Schaik (2009) have found that perceived usefulness variable explain 69% of the variance in attitude towards computer use among pre-service teachers enrolled at the National Institute of Education in Singapore. This means that attitude towards computer use, whether positive or negative, are shaped by how teachers perceive the usefulness of technology in teaching and learning. Furthermore, perceived usefulness has direct and indirect effects towards behavioural intention. Teo et al. (2008) find that perceived usefulness has a positive and direct effect on pre-service (Singaporean and Malaysian) teachers' intention to use technology. This means that a student teacher will tend to use technology if he/she perceives technology to be a useful and meaningful way to work more effectively. Following the findings from the literature, the following hypotheses are proposed:

H1 Perceived usefulness use will significantly and positively influence student teachers' attitude towards computer use.

H2 Perceived usefulness use will significantly and positively influence student teachers' behavioural intention.

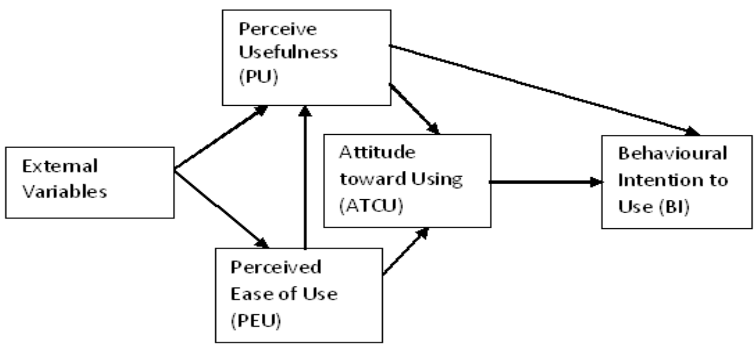

Figure 1: Technology Acceptance Model (TAM)

Perceived ease of use

Perceived ease of use is defined as the degree to which a person believes that using the system would be free of effort (Davis, 1989). Many literatures provide evidences of the impact of perceived ease of use on the attitude towards usage and behavioural intention (Šumak, Hericko, Pusnik, & Polancic, 2011; Teo, 2011; Wong & Teo, 2009). Wong & Teo (2009) find that perceived ease of use is significant determinants of the attitude and intention to use technology among student teachers. Furthermore, perceived usefulness has a direct impact on the intentions to use while perceived ease of use influences intentions to use indirectly through attitude. Šumak et al. (2011) reveals that the perceived ease of use is a factor that directly affects students' attitude. This finding is in congruence with that of Davis (1989) and Davis et al. (1989). Davis et al. also find that perceived ease of use would have only one direction towards perceived usefulness and this has been confirmed by recent studies (Antonio et al., 2008; Šumak et al. 2011, Teo, 2011). In addition, it has been noted in technology acceptance research that perceived ease of use has direct and indirect effects towards behavioural intention (Davis, 1989; Teo, 2009; Wong & Teo, 2009). Based on these understanding, the following hypotheses are generated.

H3 Perceived ease of use will significantly and positively influence student teachers' perceived usefulness.

H4 Perceived ease of use will significantly and positively influence student teachers' attitude towards computer use.

Attitude towards computer use

There is a growing number of research to suggest that attitude towards computer use have a strong link to behavioural intention and thereafter to actual behaviour (Davis, 1989; Wong & Teo, 2009; Šumak et al., 2011). Behavioural intention is used as the dependent variable in this study as it is known to be a more practical way to measure technology use among student teachers (Teo & Noy, 2011). Most of the student teachers possess little or no experience in using computers in the actual school environment. As such it is deemed to be more accurate to measure student teachers' intentions to use computer, rather than their actual usage (Wong & Teo, 2009). Teo et al. (2008) reveal that attitude towards computer use explain 88% of the variance in behavioural intention among Malaysian pre-service teachers. In other words, attitude towards computer use affect how teachers respond to the technology. This leads to the hypothesis:

H5 Attitude towards computer use will significantly and positively influence student teachers' behavioural intention to use computer.

METHOD

Research design

Data were gathered with a survey questionnaire, containing questions focusing on demographics and scales measuring the variables in the research model: perceived usefulness, perceived ease of use, attitude towards computer use and behavioural intention. Confirmatory factor analysis (CFA) was carried out to establish factorial validity and the structural equation modelling (SEM) was used for model comparison and hypotheses testing.

Instruments and data collection

A self-report questionnaire was used in this study. In addition to providing their demographic information, participants were required to respond to 12 items, specifically, perceived usefulness (3 items), perceived ease of use (3 items), attitude towards computer use (3 items) and behavioural intention (3 items). Respondents were asked to indicate the items on a four Likert scale whether they strongly disagree (1), slightly disagree (2), slightly agree, (3) and strongly agree (4) with the statements. These items were adapted from various published sources (Appendix 1). All items were presented in English.

Participants

Participants in this study were 302 student teachers from a teacher education university in Malaysia. Among these participants, 64.2% (194) were female and the mean age of all participants was 23.4. Almost all the participants accessed a computer at home (98%) and their mean length of computer use was 7.88 years. Participation by the student teachers was wholly voluntary and no course credits were given for their participation. All participating student teachers were briefed on the purposes of the study and have been informed that they can withhold their participation during or after they had completed the questionnaire. Respondents took approximately 15 minutes to complete the questionnaire. Questionnaires were distributed and collected during the final hour on the last day of lectures.

RESULTS

The analysis of the research was conducted in two phases. The first phase involved the validation of the model. The second phase involved the assessments and significance of the exogenous and endogenous variables towards computer use among student teachers.

Measurement model validation

A confirmatory factor analysis (CFA) was conducted to test the factor structure of the 12-item scale using AMOS. The four latent constructs were assumed to be correlated. According to the modification indices provided by AMOS, one indicator (ATCU3) was dropped from the initial measurement model as it loaded below 0.4. Hair (2010) noted that any factor loading below 0.50 was considered to be insignificant. The overall fit model for the final measurement model was estimated to ensure a good data fit with the model (refer to Figure 2). The five absolute fit indices (Good-of-fit): χ^2 goodness-of-fit statistic, χ^2/df, Goodnees of Fit (GFI), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Standardized Root Mean Square Error of Approximation (RMSEA) were assessed. Absolute fit indices measured how well the proposed model reproduced the observed data. According to Hair (2010), the value of GFI and CFI should be more than 0.95 and RMSEA smaller than 0.05 to be considered good fit. For χ^2/df, the value below 3 was considered acceptable. TLI value should be greater than 0.90. The 12-item scale indicated some improvement of model fit and met the minimum thresholds for acceptable model's fit. Table 1 provided a summary of the estimated fit indices of the final measurement model.

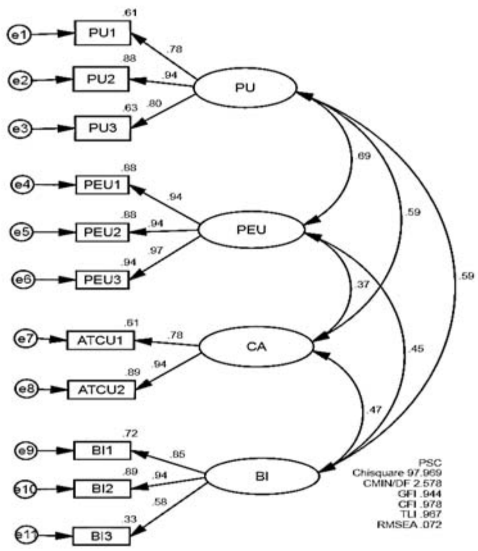

Figure 2: Factor structure of the TAM. Coefficients are standardized factor loadings.

Table 1: Good-of-fit indices for the measurement model

Fit indices	*Revised Model*	*Criteria*[a]
χ^2 Statistic	97.969**	Insignificant but significant *p*-value can be expected.
χ^2/df	2.578	<3
RMSEA	0.072	<0.08
GFI	0.944	≥0.90
CFI	0.978	≥0.90
TLI	0.967	≥0.90

[a] References were taken from: Hair (2010), Kline (2005) and McDonald and Ho (2002)

Besides assessing the items validity, mean and standard deviation for the determinants were validated (Table 2). All means scores were > 2.5 of the midpoint, ranging from 2.5 to 3.1. This indicated an overall positive response to the scales in the study. The standard deviation (SD) values showed a narrow spread around the mean. Multivariate normality can be assessed through the inspection of univariate distribution index values, with univariate skew indexes greater than 3.0 and kurtosis indexes greater than 10 indicative of unacceptable non-normality (Kline, 2005). Skew and kurtosis indices for all scales were acceptable. Internal reliability was adequate for all measures. The data in this study was regarded as normal for the purposes of structural equation modelling.

Table 2: Descriptive statistics of the study constructs

Construct	*Mean*	*Standard deviation*	*Skewness*	*Kurtosis*
PU	2.54	.926	-.021	-.155
PEU	3.06	.909	-.750	-.535
ATCU	2.60	.665	.108	-.876
BI	2.78	.849	-.080	-1.181

To ensure that the constructs (perceived usefulness, perceived ease of use, attitude toward computer use and behavioural intention) had high validity, composited reliability (CR), average variance extracted (AVE) and discriminate validity of each construct were examined. The composite reliability (CR) of each construct was assessed using Cronbach's alpha. The composite reliability for all the factors in the measurement model range from 0.82 to 0.97 (Table 3) and it exceeded the recommended threshold value (Sekaran, 2003). According to Sekaran (2003), if the value of Cronbach's alpha had coefficient less than .60, the reliability would be low, between .60 and .80 would be moderate and acceptable, and more than .08 would be considered high. According to Hair (2010), in order to ensure the AVEs index were adequate for testing structural equation modelling, it should equal or exceed 0.50. Table 3 showed that the AVEs for each measure exceeded 0.50. This meant that more than one-half of the variance observed in the items was accounted for by their hypothesised factors. Factor loadings, composited reliability coefficient and AVEs met the recommended guidelines, indicating that the convergent validity for the proposed constructs of the measurement model was adequate for structural equation modelling.

Table 3: Convergent validity for the measurement model

Latent Variable	*Item*	*Average Variance Extracted (≥.50)**	*Composite Reliability (≥.50)**
PU	PU1	.711	.87
	PU2		
	PU3		
PEU	PEU1	.902	.97
	PEU2		
	PEU3		
ATCU	ATCU1	.746	.85
	ATCU2		
BI	BI1	.647	.82
	BI2		
	BI3		

[a] AVE: Average Variance Extracted = (∑λ2) / (∑λ2) + (∑(1 – λ2)).
[b] Composite Reliability = (∑λ2) / (∑λ2) + (∑ (1 – λ2)).
[c] This value was fixed at 1.00 in the model for identification purposes.
*Indicates an acceptance level or validity.

Table 4 showed the results of testing the discriminant validity of the measure scales. According to Teo and Noyes (2011), discriminant validity will be present when the variance shared between a construct and any other construct in the model was less than the variance of the constructs shared with its indicators. If the square roots of the AVEs were greater than the off-diagonal elements in the corresponding rows and columns, it would suggest that the given construct was more strongly correlated with its indicators than with the other constructs in the model (Teo, 2009). The elements in the matrix diagonals of this proposed model, representing the square roots of the AVEs, was greater in all cases than the off-diagonal elements in their corresponding rows and columns. The values suggested that discriminant validity was present at the latent variables in the proposed research model.

Table 4: Discriminant validity for measurement model

	PU	*PEU*	*ATCU*	*BI*
PU	(.932)			
PEU	.649**	(.984)		
ATCU	.525*	.408*	(.921)	
BI	.521**	.406*	.418**	(.905)

Note: Diagonal in parentheses: square root of average variance extracted from observed variables (items); Off-diagonal: correlations between constructs.
*$p < .05$; **$p < .01$.

Structural model validation

The computer program software AMOS18 (Arbuckle, 2005) was used to test the research model using a structural equation model approach (SEM). A similar set of model-fit indices was carried out to test the structural model of the study. The five absolute fit indices were χ^2/df, GIF, CFI, TLI and RMSEA.

Several models were computed. First, assessment on the null hypothesis model (M0) was made. The null hypothesis model (M0) indicated that all the determinants to be uncorrelated. Second, the direct effect model (M1) was tested; PU→BI, PEU→BI, ATCU→BI and all other paths were set to zero. A fully correlated model (M2); PU→BI, PU→ATCU, PEU→BI, PEU→ATCU, PEU→PU and ATCU→BI was then tested.

Table 5: Good-of-fit indices and comparison of alternative models

Model	χ^2	df	GFI	CFI	TLI	RMSEA	χ^2/df	$\chi^2(df)$sig	Comparison
Null model									
M0	2721.552**	55	.00	.00	.00	.401	49.483		
Direct model									
M1	360.779**	41	.833	.880	.839	.161	8.79		
Fully correlated model									
M2	97.969**	38	.944	.978	.767	.072	2.578	(3), 262.81**	M2 vs M1
Partial correlated model									
M3	99.883**	39	.944	.977	.968	.072	2.561	(1),1.914(ns)	M3 vs M2
Multi-Group									
M4 (Constrained model)	307.447	90	.861	.920	.902	.09	3.416		
M5 (Unconstrained model)	226.474**	78	.886	.945	.923	.08	2.904	(1),80.973(ns)	M5 vs M4

*p<.05; **p<.01; ns= not significant

Table 5 showed that some statistics found in M0, M1 and M2 did not reach the minimum thresholds typically requested for an acceptable fit. These findings suggested that an improvement in the model was still possible to reach an acceptable fit model. Testing for partial correlated model (M3) was carried out. Based on the minimum thresholds for acceptable model's fit, a modified model was built as depicted in Figure 3. Estimation of this modified model showed much better fit statistics, which reached minimum thresholds for acceptable model's fit (χ^2 = 99.883, p<0.00; χ^2/df =2.561; GFI=.944; CFI=.977; TLI=.968 and RMSEA = 0.072). In the case of χ^2 Statistic, it was found to be too sensitive to sample size differences, especially for studies with large samples. Hair (2010) noted that, as the sample size increased, there would be a great tendency for the χ^2 statistic to indicate significant differences. It was also considered worthwhile to evaluate the research hypotheses based on the proposed model (Figure. 2).

To validate the model (M3), multi-group analyses were done. A multi-group analysis was carried out to verify whether significant differences existed between two samples underlying the same model. In this study, multi-group analysis was based on gender. This analysis compared a constrained model, in which the paths of the measurement and structural models were constrained to be equal, against an unconstrained one, in which the structural weights and structural residuals were estimated freely and the paths were not constrained to be equal, respectably. Results showed that there were no significant differences between the two models (Constrained Model: χ^2 =307.447; χ^2/df =3.416; GFI=.861; CFI=.920; TLI=.902 and RMSEA = 0.09; Unconstrained Model: χ^2 =226.474; χ^2/df =2.904; GFI=.886; CFI=.945; TLI=.923 and RMSEA = 0.08). This concluded that the multi-group testing showed that the M3 model was invariant across groups. With these validations, it was also considered worthwhile to evaluate the research hypotheses based on M3 model (Figure 3).

Hypotheses Testing

Figure 3 showed parameter estimates for hypothesised model. Hypothesis H1, H2, H3 and H5 were supported by the data. Perceived usefulness was a significant influence on attitude towards computer use (β=.65, p<.00) and behavioural intention (β=.48, p<.00). Perceived ease of use was a significant influence on perceived usefulness (β=.69, p<.00). Finally, behavioural intention were found to be influenced by attitude towards computer use (β=.19, p<.01).

Attitude towards computer use was found to be significantly determined by perceived usefulness and perceived ease of use, resulting in an R^2 of 0.358. That is, perceived usefulness and perceived ease of use explained 35.8% of the variance in attitude towards computer use. Perceived usefulness was significantly determined by perceived ease of use and the percent of variance explained was 47.8% (R^2 = 0.478). Altogether, the model accounted for 37.3% of the variance in behavioural intention. A summary of the hypotheses testing results is shown in Table 6.

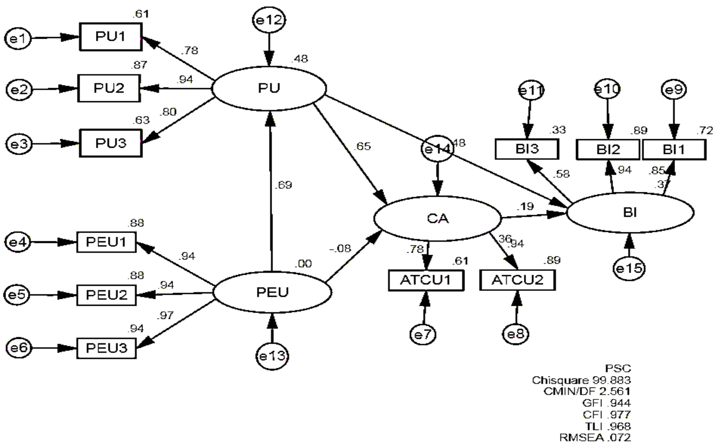

Figure 3: Standardised path coefficients for all respondents

Table 6: Hypothesis testing results

Hypotheses	*Path*	*Hypothesis*	*Results*
H1	PU→ATCU	Positive	Supported
H2	PU→BI	Positive	Supported
H3	PEU→PU	Positive	Supported
H4	PEU→ATCU	Negative	Not Supported
H5	ATCU→BI	Positive	Supported

DISCUSSION

This study empirically validated the TAM in a Malaysian educational context. The TAM was validated based on its variance-covariance matrices. In accordance to the findings, the factorial structure of the TAM has provided evidence that the items can be applied in a Malaysian context as a measure of technology acceptance among student teachers. According to the result of the goodness-of-fit test, the findings of this study led to the conclusion that the model represented the student teachers' intentions to use computers in teaching and learning.

The results showed that the third model was the best fit. Overall, the model accounted for 37.3% of the variance in behavioural intention to use computers among Malaysian student teachers. The findings of this research have added to the literature of the research and practice of educational technology development in a Malaysian context.

As expected, perceived usefulness and attitude towards computer use were found to have a significant positive influence on student teachers' behavioural intention to use computer in teaching and learning. This findings supported current research that suggested the positive and strong relationship among perceived usefulness and attitude towards computer use to behavioural intention (Lin, 2011; Moran, et al. 2011; Pynoo, et al. 2011; Šumak et al. 2011; Teo, 2011). From the effect sizes, the most dominant determinant of behavioural intention behavioural intention is perceived usefulness (β=.65, p<.00), followed by attitude towards computer use (β=.19, p<.01).

Attitudes towards computer use showed less variance if compared to perceived usefulness. This may be due to the fact that student teachers gave greater importance to computer usefulness in their teaching activities. Another plausible reason for such differences could be the curricula that were used in teacher training institutions. Most student teachers were exposed to technology integration in teaching and learning on various aspects and had the opportunity to attend technology related subjects. These factors could result in student teachers taking a practical approach towards computer acceptance irrespective of their attitude (Teo & Schaik, 2009).

Given the importance of 'computer usefulness' in relation to technology acceptance, teacher educational programs should enhance student teachers' knowledge and belief on the usefulness of technology in teaching and learning. Curricular underlying teacher educational programs should ensure that these knowledge and belief are emphasised when designing educational technology courses as well as modifying the content of the courses so that student teachers have greater engagement in technology. In addition, teacher educators or lecturers can increase student teachers' level of computer usefulness by demonstrating the usefulness of computer in their daily instructional processes. However, efforts should be made to encourage more positive computer attitude among student teachers, since many findings from the previous researches have indicated that attitude has significant impact on teachers' acceptance of technology (Chen, 2010; Compeau & Higgins, 1995; Park, 2009; Teo, 2009; Venkatesh, 2000; Wong et al., 2010). By meeting the needs related to technology integration and helping to instil more favourable computer attitude will directly assist in the integration of technologies into their teaching and learning activities.

Contrary to the researchers' expectation, perceived ease of use did not have a significant influence on student teachers' attitude towards computer use, and this is not in accordance with the findings of prior studies (Chen, 2010; Compeau & Higgins, 1995; Park, 2009; Teo, 2009; Venkatesh, 2000; Wong et al., 2010). This means that perceived ease of use is not an important determinant in computer attitude and intentions to use technology for teaching and learning among student teachers. It is reasonable to expect that student teachers are not likely to use technology simply because it is easy to use. Student teachers may be familiar with relatively advanced and complex teaching applications such as Web 2.0, Gapminder World, Google SketchUp or SMART Notebook software and other related software and prefer to be challenged when using computers for planning teaching and learning activities. Student teachers may feel bored when they find the applications too simple for them and are reluctant to use them. However, further studies are required to validate it.

Consistent with the literature, perceived usefulness is found to be predicted by perceived ease of use (Davis et al., 1989; Liu et al., 2010; Wong & Teo, 2009). When student teachers' possess a favourable judgement of computer ease of use, they tend to be inclined to believe the usefulness of computer in teaching and learning.

LIMITATIONS AND DIRECTION FOR FUTURE RESEARCH

Although care has been taken to ensure that the methodology in this study is sound, there are limitations. It is essential to conduct further studies on the factorial structure of the 12-item scale underlying the TAM. In particular, one of the items (ATCU3) has been dropped due to the low factorial loading. Thus, future research should be replicated by using a larger sample, so that the results can be more generalised as a whole. In this study, the participants are from a single university. Since previous computer experience, age and access to computer at home have been used to determine the correlation between perceived ease of use and attitude towards computer use, future research could test for the model invariance across those variables. Also, it is reasonable to expect that having multi-group comparison between student teachers and practicing teachers could further enhance the applicability and robustness of the TAM in a Malaysian context. This is an important consideration given that practicing teachers are more likely than student teachers to be requested in regards to the use of technologies.

The selected determinants used in this study were not able to reflect the overall 'intentions to use' of computers among student teachers as the total variance accounting for behavioural intention was only 37.3%, leaving 62.7% unexplained. Hence, this result indicated that policymakers and teacher educators should reorient the pre-service education curriculum to help enhance the use of computers in teaching and learning among student teachers. Finally, since technology will continue to grow and develop rapidly, a replication of this study should be conducted periodically in order to examine education technologies trends to update and provide appropriate knowledge and skills for further pre-service and in-service teachers.

REFERENCES:

Ajzen, I. (1985). From intentions to actions: A theory of planned behaviour. *In J. Kuhl, J. Beckmann (eds). Action Control: from Cognition to Behavior*. New York: Springer Verlag, 11-39.

Ajzen, I. & Fishbein, M. (1980). *Understanding Attitudes and Predicting Social Behavior*. New Jersey: Prentice-Hall.

Akbab-Altum, S. (2006). Complexity of integrating computer technologies into education in Turkey. *Educational Technology and Society*. *9*(1),176-187.

Antonio, P., Aurora, G., & Ana, R.D.A. (2008). Factors affecting e-collaboration technology use among management students. *Computer & Education, 51*(2), 609-623.

Arbuckle, J.L. (2005). *Amos 6.0 user's guide.* Chicago, IL: SPSS, Inc.

Chen, R. (2010). Investigating models for preservice teachers' use of technology to support student-centered learning. *Computer and education, 55*, 32-42.

Compeau, D.R., & Higgins, C.A. (1995). Computer self-efficacy: Development of a measure and initial test. *MIS* Quarterly, *19*(2), 189-211.

Davis, F.D. (1989). Perceived usefulness, perceived ease of use and user acceptance of information technology. *Management Information Systems Quarterly. 13* (3), 983-1003.

Davis, F.D., Bagozzi, R.P., & Warshaw, P.R. (1989). User acceptance of computer technology: a comparison of two theoretical models. *Management Science, 35*(8), 982-1003.

Efe, R. (2011). Science student teachers and educational technology: Experience, intentions and value. *Educational technology & society, 14*(1), 228-240.

Fishbein, M., & Ajzen, I. (1975). *Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research*. Reading MA: Addison-Wesley.

Hair, J.F. (2010). *Multivariate data analysis: a global perspective.* Upper Saddle River, NJ: Person Prentice Hall.

Kline, R. B. (2005). Principles and practice of structural equation modelling (2nd ed.). New York: Guilford Press.

Lin, K. (2011). E-learning continuance intention: Moderating effects of user e-learning experience. *Computer & Education. 56*(2), 515-526.

Liu, F., Chen, M.C., Sun, Y.S., Wible, D., & Kuo, C. (2010). Extending the TAM model to explore the factors that affect intention to use an online learning community. *Computer & Technology, 54*(2), 600-610.

McDonald, R.P., & Ho, M-H, R. (2002). Principles and practice in reporting structural equation analyses. *Psychological Methods, 7*, 64 – 82.

Ministry of Education. (1997). *Smart School Flagship Application: The Malaysian Smart School – A conceptual blueprint*. Putrajaya: Government of Malaysia.

Ministry of Education (2006). *National Education Blueprint.* Putrajaya :Government of Malaysia.

Moran, M., Hawkes, M., & Gayar, O.E. (2011). Tablet personal computer integration in higher education: Applying the unified theory of acceptance and use technology model to understand supporting factors. *Journal of Educational Computing Research. 42*(1), 79-101.

Park, S.Y. (2009). An analysis of the technology acceptance model in understanding university student's behavioural intention to use e-learning. *Educational Technology & Society, 12* (3), 150-162.

Pynoo, B., Devolder, P., Tondeur, J., Braak, J., Duyck, W. & Dyck, P. (2011) Predicting secondary school teachers' acceptance and use of a digital learning environment: A cross-sectional study. *Computers in Human Behavior, 27*(2), 568-575.

Sekaran, U. (2003). *Research Methods for Business. A Skill Building Approach.* (fourth edition), Cambridge Massachusetts: Harvard University Press.

Šumak, B., Hericko, M., Pusnik, M., & Polancic, G. (2011). Factors affecting acceptance and

use of Moodle: an empirical study based on TAM. *Slovenian Society Informatika, 35*(1), 91-100.

Taylor, S., & Todd, P. (1995). Understanding information technology usage: A test of competing models. *Information Systems Research 6*(2), 144 -176.

Terzis, V., & Economides, A.A. (2011). The acceptance and use of computer based assessment. *Computer & Education, 56*(4), 1032-1044.

Teo, T. (2011). Factors influencing teachers' intention to use technology: Model development and test. *Computers & Education*, doi: 10.1016/j.compedu.2011.06.008

Teo, T. (2010). Efficiency of the technology acceptance model to explain pre-service teachers' intention to use technology. A Turkish study. *Campus Wide Information System, 28*(2). 93-101.

Teo, T., & Schaik, P.V. (2009). Understanding technology acceptance in pre-service teachers: A structural equation modelling approach. *The Asia Pacific Education Research, 18*(1), 47-66.

Teo, T. (2009). The impact of subjective norm and facilitating conditions on pre-service teachers' attitude toward computer use: a structural equation modelling of an extended technology acceptance model. *Journal educational computing research, 40*(1), 89-109.

Teo, T., & Noyes, J. (2011). An assessment of the influence of perceived enjoyment and attitude on the intention to use technology among pre-service teachers: A structural equation modelling approach. *Computer & Technology, 57*(2), 1645-1653.

Teo, T., Wong, S.L., & Chai, C.S. (2008). A cross-cultural examination of the intention to use technology between Singaporean and Malaysia pre-service teachers: An application of the TAM. *Educational & Society, 11*(4), 265-280.

Thompson, R.L., Higgins, C.A., & Howell, J.M. (1991). Personal computing: Toward a conceptual model of utilization. *MIS Quarterly, 15*(1), 124 -143.

Venkatesh, V. (2000). Determinants of perceived ease of use Integrating Control, Intrinsic Motivation, and Emotion into the Technology Acceptance Model. *Information Systems Research 11*(4), 342-365.

Venkatesh, V.,& Davis, F.D. (2000). A theoretical extension of technology acceptance model: Four longitudinal field studies. *Management Science, 46,* 186-204.

Venkatesh, V., & Morris, M.G. (2000). Why don't men ever stop to ask for directions? Gender, social influence and their role in technology acceptance and usage behavior. *MIS Quarterly, 24*(1), 115-139.

Venkatesh, V., Morris, M.G., Davis, G.B., & Davis, F.D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quaterly, 27*(3), 425 – 478.

Wang, W., & Wang, C. (2009). An empirical study of instructor adoption of web-based learning systems. *Computer & Education, 53*(3), 761-774.

Wong, K.T., Goh, S.C., Hafizul Fahri, & Rosma Osman (2010). Computer attitudes and use among novice teachers: The moderating effects of school environment. *Malaysian Journal of Learning and Instruction*, 7, p. 93-112.

Wong, S.L., & Teo, T. (2009). Investigating the technology acceptance among student teachers in Malaysia: An application of the technology acceptance model (TAM). *The Asia-Pacific Education Researcher, 18*(2), 261-272.

Appendix 1

Constructs and corresponding items

Item	*Statement*	*Reference*
Perceived Usefulness (PU)		
PU1	I could improve my performance by using computers.	Davis (1989), Venkatesh et al. (2003), and Teo (2009)
PU2	I could increase my productivity by using computers.	
PU3	I could enhance my effectiveness by using computers.	
Perceived Ease of Use (PEU)		
PEU1	It is easy for me to do works that I want to do by using computers.	Davis (1989), Venkatesh et al. (2003), and Teo (2009)
PEU2	I find computers easy to use.	
PEU3	My interaction with computers is clear and understandable.	
Attitude Toward Computer Use (ATCU)		
ATCU1	Working with computers make learning more interesting.	Compeau and Higgins (1995), Thompson et al. (1991), and Teo (2009)
ATCU2	Working with computers is fun.	
ATCU3(dropped)	I look forward to that job that requires me to use computers.	
Behavioural Intention (BI)		
BI 1	Whenever possible, I intend to use computers for teaching and learning.	Davis (1989), Venkatesh et al. (2003), and Teo (2009)
BI 2	I plan to use computers during my teaching practicum.	
BI 3	I will use computers in future.	