The usage of technology among education students in University Utara Malaysia: An application of extended Technology Acceptance Model

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ABSTRACT

This paper reports the findings of perceived usefulness and perceived ease of use on the extent of computer usage among a group of full time Bachelor of Education undergraduates at the College of Arts and Sciences, University Utara Malaysia. This study is based on Technology Acceptance Model (TAM) and also looks at the moderating role of gender in the above relationship questionnaires were used to collect data. A total of 120 students responded to the survey. Results from the study shows that perceived usefulness (ß=0.29, p<0.01), perceived ease of use (ß=0.25, p<0.01), and subjective norm was (ß=0.15, p<0.05) were positively related to computer usage. The findings also revealed that gender was not a moderator in the mentioned relationship but can be considered as significant independent predictor of usage. Male students exhibited higher usage of the computer compared to the female students.

Keywords: *perceived usefulness, perceived ease of use, subjective norm, gender, computer usage, Technology Acceptance Model.*

INTRODUCTION

Technology changes the way of learning in the classroom. Students are no longer bound, physically, by the bricks and mortar that surround them. Instead, they have at their fingertips the opportunity to explore the world and take in vast amounts of information along the way. We are only just beginning to realise the potential of technology in helping to improve student learning and increase academic performance.

In Malaysia, computers introduced in early 1990s whereas Personal Computer PCs in early 2000. Internet development in Malaysia can be traced back to 1988 when the Malaysian Institute of Microelectronic Systems (MIMOS) set up the university computer network called Malaysian Computer Network. Now the latest technologies such as broadband, wireless and Bluetooth have become a part of the daily life of a student (MIMOS, 2009).

The college of Arts and Sciences, Division of Education, University Utara Malaysia is offers a bachelor's degree in Education with honours. The graduates can choose a specialization in areas such as moral studies, information technology, accounting and mathematics. This study focused on student teachers. One of the domains of Bachelor of Education programme is mastery of computer skills. Students are expected to use the Internet facility independently to access vast amount of electronic resources from the university library. This includes electronic books, electronic magazines, electronic journals and other periodicals. Even though remarkable efforts have been set into integrating technology especially personal computers into the daily lives of the students the level of technology among education student remains low (Ramayah et al., 2005). There are many factors contributing to underutilisation. Factors such as cost of PC, availability of computer lab, motivation of the students, computer literacy hinder the total use (Ramayah et al., 2002). For example the education division has only three computer labs but only two fully functioning with 40 computers each. All PCs are connected to the internet.

Universities have been investing hundred thousand ringgit in subscribing to online libraries, but researches have revealed that prospective users may still not use the facilities (Thong et al., 2002). Further online resources remain unnoticed by students or be seriously underutilised in term of their availability (Hammond, 1994; Wood et al., 1995; Hsieh-Yee, 1996; Mallick, 2010; Tay et al., 2004; Ramayah, 2006). The proclamation that the online library is seriously underutilised is based on subjective evidence gathered by talking to students and also in two unpublished reports. The first, by Mallick (2010) found that only 22% of the respondents used the online library as most were comfortable use traditional library. Further Tay et al. (2004) also found that only 46% had experience of using the online library. Again, from this 46% of users, 84% used the online library less than once a week, which points to a wastage of the services provided.

Ramayah et al. (2005) conducted a study on PC usage among students of private institutions of higher learning and found that most students were still unaware about the usefulness of advanced applications although they are regular users of PC with many years of experience (taking into consideration both the number of hours in contact with PC and the years since first being introduced to the technology). Most use the PC for basic tasks only such as using word processing and spreadsheets, and have not moved on to more challenging programmes like graphics, web page design, statistical software, etc.

The aim of this study is to understand student teachers' computer usage at faculty of Education, University Utara Malaysia based on Technology Acceptance Model. The usage of this model could answer some questions relating to acceptance and usage of technology in teaching and learning. Furthermore, it is essential for the university management to better understand how gender plays role in PC usage.

The main objectives of this paper are: to measure the extent of usage of the computers among the education undergraduates.
1. to test the determinants of usage (i.e., perceived usefulness, perceived ease of use, subjective norm) and,
2. to see the moderating role of gender in the perceived usefulness, perceived ease of use, subjective norm and usage relationship.

THEORETICAL FOUNDATION

Davis (1986) technology acceptance model (TAM). TAM has proven to be a theoretical model in helping to explain and predict user behaviour of information technology (Legris, Ingham, & Collerette, 2003). TAM provides two cognitive views are perceived usefulness and perceived ease of use. According to TAM, one's actual use of a technology system is influenced directly or indirectly by the user's behavioural intentions, attitude, perceived usefulness of the system, and perceived ease of the system. TAM also proposes that external factors effect intention and actual use through mediated effects on perceived usefulness and perceived ease of use. Figure 1 depicts the modified TAM (Davis, 1989).
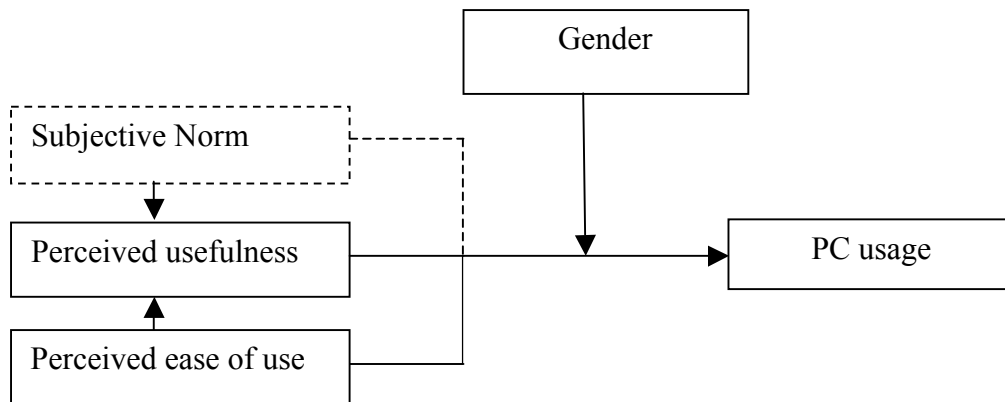
Figure 1. Modified Technology Acceptance model

LITERATURE REVIEW

Related studies on Perceived usefulness (PU) and perceived ease of use (PE)

Davis (1989) defined perceived usefulness and perceived ease to use as follows:

Perceived usefulness: The degree to which an individual believes that using a particular system would enhance his or her job performance.

Perceived ease to use: The degree to which an individual believes that using a particular system would free of physical and mental effort. Effort is an exertion of strength or power, whether physical or mental, in performing an act or aiming at an object. Davis defined this as "the degree to which a person believes that using a particular system would be free from effort" (Davis, 1989).

A number of studies revealed the importance of perceived usefulness and perceived ease to use in forecasting human behaviour. Importance of perceived use could be found in the Tornatzky and Klein's (1982) on innovation adoption. Further Bandura (1982) proved the importance of considering both perceived usefulness and perceived ease to use in predicting a person's behaviour. Previous researches (Segars and Grover, 1993; Igbaria et al., 1995, 1996, 1997; Ndubusi et al., 2001; Ramayah et al., 2002, 2003, 2003, 2005; Lee et al., 2005; Liu et al., 2005; Pituch and Lee, 2006; Saadé et al., 2007; Ramayah and Mastura, 2008) proved that perceived usefulness influence the technology usage of a person. Perceived ease of use was a significant predictor of intention to use mobile services in Norway (Nysveen , 2005). Other researches also have found ease of use to be influential in system usage (Adams et al., 1992; Davis, 1989; Koay, 2002; Ramayah et al., 2002; Ramayah et al., 2005). Results from these and other studies suggest that adequate explanation and/or prediction of user acceptance of technology. While perceived usefulness has been identified as consistently important in attitude formation, support for perceived ease to use has been inconsistent and less significance.

Ho1:   A student teacher's computer usage will be significantly influenced by his or her perceived usefulness of computers.

Ho2:   A student teacher's computer usage will be significantly influenced by his or her perceived ease of use of computers.

Subjective norm (SN)

Subjective norm refers to a person's perception that people who are important to him/ her think whether the behaviour in question should or should not perform (Fishbein & Ajzen, 1975). Marcinkiewwicz and Regstad (1996) conducted a study about the influence of SN on computer. They found SN is the most predictive of the computer use, alongside self-competence, perceived relevance and innovativeness. Even though the subjective norms and attitudes are separate constructs in the theory of reasoned action (TRA) (Fishbein & Ajzen, 1975), recent studies have suggested positive relationships between them (e.g. Pan, Sivo & Brophy 2003; Venkatesh *et al.* 2003).

Therefore, it is hypothesised that:
Ho3:   A student teacher's computer usage will be significantly influenced by his or her subjective norm.

Usage (U)

The dependent variable usage of computers was adapted from Teo *et al.,* (1999); Igbaria *et al.,* (1995). The computer usage will be assessed by having them agree or disagree on a five-point scale with a series of statements about their level of usage.

Gender

Although the original gender gap in computer and Internet use appears to have narrowed to the point of nonexistence (DiMaggio et al., 2004; Hargittai, 2008; Feller, 2006) studies suggest that men and women use these technologies in different ways (Lenhart and Madden, 2005; Odell, 2000; Sherman et al., 2000) (For example, adolescent girls (aged 15–17) are slightly more likely than boys to use home computers for e-mail, word processing, and completing school assignments as opposed to connecting to the Internet, creating spreadsheets or databases, using graphics and design software, managing household records or finances, or playing games (Lenhart and Madden, 2005). Although time spent online is about equal for both genders, more female college students use the Internet for e-mail (Odell et al., 2000; Sherman et al., 2000) and to conduct academic research than males (Odell et al., 2000; Selwyn, 2008). Male college students are also more likely to research purchases, look for news, and play games online. Related research has suggested that, in general, women are more likely to use the Internet for interpersonal communication, while men are more likely to use it for entertainment and to shop online (Lenhart and Madden, 2005; Joiner et al., 2005; Morgan and Cotten, 2003). Prior research has shown that male college students rated computers as more useful than female students (Koohang, 1989; Shashaani and Khalili, 2001). Additionally, Venkatesh and Morris (2000) indicate that men consider perceived usefulness to a greater extent than women in making their decisions considering usefulness or productivity-related factors of a new technology and that man are more driven by instrumental factors than women. Dahlan et al. (2002), found that Malaysian banking male employees were more ready in data mining readiness compared to female

employees. Futher Ramayah and Osman (2005) revealed that male students use the course websites more than female students.

METHODOLOGY

Three independent variables, a dependent variable (perceived ease to use, perceived usefulness, and subjective norm and a moderator (i.e. gender) were involved in this study.

The study targeted all the undergraduate students whom enrolled in the Bachelor of Education programme. Choice of targeted education students was based on the likelihood of their current or potential involvement with e-learning programs in the foreseeable future. The total number of students enrolled is 553. A convenience sampling was used to gather data using a structured questionnaire adopted from Davis (1989). Students were intercepted after their classes at the various lecture halls and completed a self-administered questionnaire. The instrument was composed of 15 statements on PU (four items), PE (four items), SN (two items), and Usage (five items). Respondents gave their opinions to each statement on a 5-point Likert scale, ranging 1 (strongly disagree) to 5 (strongly agree). Table 1 summarises variables, sample questions and sources.

Table 1: Study variables and their sources

Variable	Sample question	Source
Independent Subjective norm	Most of people who are important to me think it is a good idea to use computers.	Fishbein and Ajzen (1975)
Perceived usefulness	Using the computers improves my work performance	Davis (1989)
Perceived ease of use	I find it easy to get computers to do what I want to do.	Davis (1989)
Dependent Usage	Extent of use of word, spreadsheet, presentation, graphics, drawing, etc.	Adapted based on Teo et al., (1999); Igbaria et al., (1995)

Respondents from various intact (moral studies, information technology, accounting) classes completed the survey questionnaire and all participants were briefed on the purpose of this study and their independency either to participate or not. Each respondent expected to spend 25 minutes to complete the questionnaire.

Data analysis

The relationship between independent and dependent variables were tested using moderated multiple regression (MMR) (Cohen & Cohen, 1983). Research indicates MMR is an appropriate technique to assess the effects of categorical moderator variables (i.e. gender) that augment the additive MMR model (Aguinis, 2004; Irwin & Mclelland, 2001). The MMR allows the relationship between the dependent variable and an independent variable to depend upon (i.e. moderated by)

the level of another independent variable. The procedure involves create new variable (include 'gender') that consists of the cross-product term between the predictor and the moderator variable. The predictor and the moderator (i.e. gender) are entered in the first block and the product term is entered in the second block (Aguinis, 2004). Thus, hierarchical regression models were then run for each of the dependent variable (usage), by entering first order effects (PU, PE, SN, gender), followed by addition of lower-order interactions (PU x gender, PE x gender, SN x gender) in the second block. If the product-term is significant, the strength of the moderator's influence can be assessed by examining the increase in R-square from first to second block. The results of MMR indicate the specific classification of the moderator variable as well as its explanatory power as determined by the increase in R-square.

RESULTS

The profile of the respondents is presented in Table 2. The respondent's profile shows that majority of them are female. This is the present trend in most of the public universities and Teacher Training Institutes where female more than male (Mallick, 2010). The ethnic composition shows a majority of Malay students which is a result of requirements from the Ministry of Education (MOE) based on projection by Teacher Training Division from MOE. The University has no power in the intake of students due to all undergraduate students of Bachelor of Education regulated by the MOE. The age of majority of the students is above 21 years old since most of them completed pre-university programme. The university provide in-campus accommodation for all the students.

Table 2: Respondents' profile

		Frequency	Percentage
Gender	Male	35	29.12
	Female	85	70.83
Race	Malay	91	75.83
	Chinese	18	15.0
	Indians	6	5.0
	Others	5	4.12
Age	< 21 years	42	35.0
	21-22 years	72	60.0
	23-24 years	6	5.0
Staying	In campus	118	98.3
	Outside campus	2	1.67

Reliability

As suggested by Fornell and Larcker (1981), three procedures were used to assess convergent validity namely (I) item reliability of each measure, (ii) composite reliability, and (iii) the average variance extracted (AVE). The item reliability was assessed by its factor loading. Hair e*t al.* (2006) suggested that an item is significant if its factor loading is greater than 0.50. Table 3 shows the eigenvalues of all contructs are more than 1.00 and the percent of cumulative variance was 56%. The factor loadings of all the items in the measure ranged from 0.63 to 0.85. This exceeds the benchmark set by Hair *et al.* (2006).

Table 3: Factor loadings of the measurement items

	Rotated factor loading	Eigenvalue	% variance explained
PU1	0.821		
PU2	0.852		
PU3	0.795		
PU4	0.824	3.526	19.024
PE5	0.625		
PE6	0.823		
PE7	0.829		
PE8	0.721	2.958	17.025
SN1	0.811		
SN2	0.752	1.746	9.682
U1	0.648		
U2	0.724		
U3	0.711		
U4	0.779		
U5	0.647	2.154	10.256

The composite reliability of each construct was assessed by Cronbach's α.   The results of the analysis are presented in the Table 4. The result of reliability analysis shows that the value for alpha is 0.83. It was greater than the benchmark of 0.60 recommended by Fornel (1982) and Nunnally (1978). This illustrate that all measure had high internal consistency and adequate reliability. The convergent validity is considered adequate if AVE equal or exceeds 0.5.

Table 4: Item reliability analysis

Factor	No. of Items	Cronbach's α	AVE
PU	4	0.85	0.79
PE	4	0.89	0.72
SN	2	0.75	0.82
U	5	0.72	0.69

This is calculated by squaring the sum of the factor loading divided by number of factors of the underlying construct.

The hypotheses regarding the main effects of three independent variables and the potential moderating effect of gender on usage of computers were tested using MMR. Table 5 shows the results of the hypothesis testing. The regression coefficient suggest that all the above had significant main effects (p<.05), supporting H01 to H03. The regression estimates for the main effects were .29 (PU), .25 (PE), .15 (SN) and -.19 (gender) and the model was significant [F(4, 115) = 36.32, p<.001]. The four predictors explained 46% of the variance in the dependent variable. Moderating effect of the gender calculated with PU x gender, PE x gender, and SN x gender interaction terms entered into the second step of the hierarchical regression model. Table 4 shows the regression estimates for the individual interaction terms were not significant

(p>0.05). This indicates moderating effect of gender not supported. In addition the findings show that inclusion of interaction terms did not significantly improve the variance explained in the model (p>.05)

Table 5: Results from the hierarchical regression analysis

Variable	Main Effect (Beta/t-Value)	Interaction effect (Beta/t-value)	Model R^2
PU	.29/3.67**		
PE	.25/3.21**		
SN	.15/2.54*		
Gender	-.19/-3.11**		0.46
Gender x PU		-0.27/-0.81	
Gender x PE		-0.11/-0.39	
Gender x SN		-0.29/-1.28	0.47
			ΔR^2=.01

*p<.05, **p<.01
PU-Perceived usefulness, PE –Perceived ease of use, SN – Subjective norm

DISCUSSION

The main aims of this study were i) to measure the extent of usage of the PC among the education undergraduates, (This is based on previous model that proved reliable to measure the usage of PC) ii) to test the determinants of usage (i.e., perceived usefulness, perceived ease of use, subjective norm) and iii) to see the moderating role of gender in the perceived usefulness, perceived ease of use and usage relationship. It was found in this sample that a total of 46% (R^2) Variance in the participants' usage towards computer While the effect size of this model considered robust for social research (R^2) (Cohen, 1992), the level of variance explained are similar to previous TAM research (Hong, Thong & Tam, 2006; Venkatesh & Ramesh, 2006; Dae & Stephen, 2011). The undergraduate students' PU and PE were key determinants of their computer usage. Both had a direct significant effect on students' teachers. In addition one external factor was included in the research model, SN. SN had a direct effect on Usage (U).

This study found that student teachers' PU was significant in determining computer usage. It contributes to recent research that found PU to be a key determinant on computer usage (e.g. Legris *et al*. 2003; Huang & Liaw 2005; Pituch & Lee 2006). The result reported that student teachers' PE had significant effects on computer usage. Sime and Priestly (2005) found that student teachers' attitudes towards that use of and ICT tools were influenced by how easy it was to use the tool and they refuse to use a too that difficult to use.

The findings confirm that there is significant influence of students' teachers' SN on their computer usage, reflecting that students' teachers' perceive their own attitude to be highly affected by their important referents. This was similar to findings by Venkatesh and Davis (2000) that SN had a significant effect on individuals' attitude towards computer use.

The result also shows that gender had a significant effect on computer usage. These findings confirm that male students exhibited higher usage compared to female students. However, the research found no support for expectations that gender can moderate computer usage in this context. As the table result suggest, gender had no significant moderating effect on the computer usage. This finding supported by the works of Venkatesh and Morris (2000), Venkatesh and

Davis (2000) and Ono and Zavodny (2002). In effort to better understand computer usage among student teachers, future studies might consider prior experience with moderated effect and cognition on attitude formation.

LIMITATIONS

Student teachers' perceptions may differ from the practicing teachers. Student teachers' may not fully appreciate the demands and work load involved in the use of computers in real school environment. Since as all trainee teachers not bonded to work as teachers upon completion of teacher training, the student teachers' not serve as a good sample to understand the opinion of future students. This may overcome if the sample selected from government sponsored teacher training institutes. Another limitation is the TAM model. The original TAM model included behavioural intention and attitudes as mediators for computer use in the model, and these are not included in this study. Further the computer usage (U) is not the only determinant, i.e. facilitating conditions may have high impact on integrating the computer in teaching and learning.

Implications

Result implies that greater attention on using computers should be focused on female students to avoid technology competence and usage gap. The school of education, UUM may organise some computer classes to familiarise them with PC and the various software. This will increase the level of ease of use and directly increase the computer usage. The education and language centres encourage lecturers to fully utilise the *Learningzone* (Learning Management System (LMS)) portal to create online materials such as course contents, quizzes, and assignments. This will increase the usage of internet for the purpose of learning and also increase the usage of computers.

CONCLUSION

The study attempted to explore student teachers' computer usage and found PU, PE, SN and gender to be significant determinant in deciding their PC usage at University. However, gender did not moderate the relationship between PU, PE and U. The research has limitations in terms of to generalise to the whole country not clear because the data were collected from a convenience sample of University Utara Malaysia. Future research could be conducted to collect data from practicing teachers to compare the results with student teachers. In addition, researcher suggest future research should incorporate perceive knowledge (PK) (of the computer) in modelling computer usage. Including PK in the model will provide more empirical evidence to test the significance of the construct in predicting computer usage. Finally, these findings are in line with the previous TAM research, providing support that PU, PE SN and gender influence computer usage.

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