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The Adoption of Wireless Classroom Technology among Undergraduates Students

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ABSTRACT

An inherent feature of technology *in education is the constant development* of *new* technologies *and creating new and modern applications* of *already existing* technologies. *To date, numerous studies that examined student perceptions on information technology and communication have been carried out. Generally, the findings showed that students' perception had an influence on the adoption of technology. Using the Technology Acceptance Model as a framework, the purpose* of *this paper is to examine relationship between students' perception of Wireless Classroom Technology and adoption of technology. Two dimensions of Wireless Classroom Technology investigated were perceived ease of use and perceived usefulness. The data were collected from 191 undergraduate information technology students from a public university located on the northern region of Peninsular Malaysia. Using regression analysis, the results indicated that there is a significant relationship between perceived ease of use and adoption of technology. This study also suggests that adoption of Wireless Classroom Technology benefits the students. The findings should guide the management of the public university to improve the information and communication technology infrastructure. Recommendations and conclusions are also presented.*

Keywords: adoption, TAM, Wireless Classroom Technology, higher learning institution, modern application.

1. INTRODUCTION

Information Technology plays an important role in shaping the future of the learning environment in higher education institutions. The pervasive network offered ensure information is instantaneously available almost anywhere (Sorenson, 2010; Ng, 2010). The web has made the internet services available in the masses while wireless technologies freeing users from the constraints of physical wires. The convergence of the technologies creating new workplace, namely wireless office, wireless home, wireless campus and wireless classroom (Williamson and Kamaluddeen, 2002). Even though there are some barriers in

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implementing wireless technology in higher institutions, the overall usage of its applications are considered successful (Lu et al., 2007). Whether the technology will be adopted or not, depends on the feeling of the users about the technology. Those who do not rely on the technology may behave negatively towards the technology (Pikkarainen et al., 2004). Technology Acceptance Model (TAM) is one of the most cited theoretical frameworks (Davis, 1989; Venkatesh et al, 2003; Venkatesh and Johnson, 2002; Chang and Tung, 2007). The model is designed to measure the relative importance of user perceptions of the systems' usefulness and ease of use in their adoption behavior (Park et al., 2009). Previous researchers also found that adoption of technology correlated positively with benefit gained by the users (Brynin, 2006; Sooryamoorthy and Shrum, 2007; Cheung and Huang, 2005). Hence, the main objective of this study is to investigate the adoption of Wireless Classroom Technology (WCT) among public university students. This study used TAM to look whether perceived usefulness (PU) and perceived ease of use (PEU) are associated with adoption of technology. The study also further investigates whether the adoption will provide benefit to the students.

2. LITERATURE REVIEW

2.1 Technology Acceptance Model (TAM)

Given the high rate of failure of Information and Communication Technology (ICT) initiatives intended for the creation of development opportunities, a solid understanding of the determinants of user acceptance of particular ICTs is crucial not only for theory building but also for practical effectiveness (Park et all., 2009). Because of that many theories that focused on the adoption of technologies have been developed since 1960s (Davis, 1989; Venkatesh et al, 2003; Chang and Tung, 2007).

From a practitioner perspective, TAM is useful for predicting whether users will adopt new information technologies (Leong, 2003). TAM is one of the most cited theoretical frameworks (Davis, 1989; Saade, 2007; Venkatesh et al, 2003; Chang and Tung, 2007). It has been developed to study factor determinants of the system usage (Davis, 1989). The model is designed to measure the relative importance of user perceptions of the systems' usefulness and ease of use in their adoption behavior (Davis, 1989; Park et al., 2009).

2.1.1 Perceived Ease of Use (PEU) and Adoption

Perceived Ease of Use refers to degree to which a person believes that using a particular system would be free of effort. This follows from the definition of 'ease': freedom from difficulty or great effort (Davis, 1989: Venkatesh et al, 2003). Application perceived to be easier to use than another is more likely to be

accepted by users (Davis, 1989; Venkatesh et al, 2003; Yusliza et al., 2009). Based on this, we predicted that adoption can be predicted by PEU.

2.1.2 Perceived Usefulness (PU) and Adoption

Davis (1989) defined perceived of usefulness as the degree to which a person believe that using a particular system would enhance his or her job performance (Davis, 1989; Venkatesh et. al., 2003). Yusliza et al. (2009) in their study revealed that PU was found to be positively related to actual usage of the system. It implies that if users feel that a system is useful, their usage level will be higher. This study aligned with previous study which found that those who do not rely on the technology may behave negatively towards the technology (Pikkarainen et al., 2004). Hence, for this study we hypothesized that adoption can be explained by PU.

2.1.3 Adoption

According to Davis (1989), the original TAM gauged the impact of four internal variables upon the actual usage of the technology. The internal variables in the original TAM were: perceived ease of use (PEU), perceived usefulness (PU), attitude toward use (A) and behavioural intention to use (BI). Davis (1989) further explained that in TAM, BI acted as both a dependent variable and an independent variable, with BI being used as a dependent variable to test the validity of the variables PU and PEU and as an independent variable when predicting actual usage (as cited in Turner et al., 2010).

Some of researchers used adoption as 'behavioral intention' and 'attitude towards use' in their study. Vankatesh et al., (2003) classified the adoption as the behavioral intention and attitude toward using the technology. Chang and Tung (2007), and Saade (2007) also use the behavioral intention as the replacement of adoption the technology in their study. A meta-analysis study conducted by Turner et al. (2010) found that PU and PEU are consistent predictors to actual usage.

In this study adoption was used to replaced behavioral intention to use and attitude toward use to measure the system usage. Adoption was used as a dependent variables against PU and PEU, an as an indepent variable to predict the benefit gained from the usage.

2.2 Benefit

Previous findings revealed that the usage of technology provide benefits to the users (Brynin, 2006; Sooryamoorthy and Shrum, 2007; Cheung and Huang, 2005). Employees who use the technology are typically more productive and earned more that those who don't use the technology (Brynin, 2006; Sooryamoorthy and Shrum, 2007). In education, technology plays an important role in shaping the learning environment (Sorenson, 2010; Ng, 2010). Information technology that are widely used to facilitate learning environment includes intenet (Park et al., 2009; Cheung and Huang, 2005; Thomas et al., 1998; Sanberg et al., 2001), library system (Park et al., 2009), wireless classroom (Sanberg et al., 2001; Y. Lu et al., 2007) and wireless devices (Y. Lu et al., 2007). Study by Cheung and Huang (2005) revealed that internet adoption correlated positively with student perceptions of general learning, and constructive learning, thus indicated that greater internet use in the university could result a better learning performance. Internet use also help student to heighten their constructive learning by enhancing their constructive learning motive and strategy.

Based on the above discussion, we proposed that benefit is related with adoption.

3. METHODOLOGY

3.1 Design of Wireless Classroom Technology (WCT)

WCT was a pilot projects that designed to support and improves the teaching and learning activities in the university. There were two classrooms renovated and equipped with wireless infrastructure to support the instructors in conducting the class. In this classroom students are allowed to bring their own wireless devices to access the contents provided by the respective systems. The wireless devices need to be configured the before it can used the technology provided in the classroom. With implementation of WCT, it was hoped that the technology was able to improve communication and interactivity in class. Hence it will help students to improve their performance.

3.2 Data Collection

The study was conducted at public university located on the northern region of Peninsular Malaysia. The respondents for this study consist of Information Technology students that have sessions at wireless classroom in Faculty of Information Technology. There were 200 questionnaires distributed in the classroom after the class ended and completed the questionnaires. Only 191 questionnaires could be used for further analysis. The remaining questionnaires were rejected due to incomplete information and missing data. Twenty three

percent (23%) of the respondents were male and 67% were female. The average age was 23 years. As for years of studies, the sample consists of first year (23.6%), second year (32.5%), third year (38.7%) and forth year (5.2%).

3.3 Measurement

There were four variables used in this study namely PEU, PU, Adoption and Benefit. The instrument to measure PU and PEU in this study was adapted from TAM by Davis (1989). The instrument had been validated by previous studies where PU and PEU are hypothesized to be fundamental determinants of user acceptance. Both PUE and PU consist of 6 items using 5-point Likert scale ranging from extremely likely to extremely unlikely.

Adoption was assessed based on four criteria: frequency of use, intensity of use, use of a variety of applications/tools, and use for a variety of tasks. The instrument to measure this variable is adapted from Cheung and Huang (2005). Four statements are used to measure this construct: 'I use the Internet/web very intensively (more than 2 hours per day)', 'I use the Internet/web very frequently (a few times per day)', 'I use the Internet/web for a variety of tasks (reports, team projects, individual homework/assignment, study collaboration, distance learning, etc.)', and 'I use a diversity of tools on the Internet/web for my studies (email, FTP, Netscape, MS Explorer, Yahoo search engine, HTML, online discussion groups, etc.)'. This variable consists of 6 items using 5-point Likert scale ranging from strongly disagrees and strongly agree.

The instrument used to measure Benefits had been validated by Cheung and Huang (2005). This variable had been used to examine the benefit of innovation adoption among students. The construct was divided into 3 dimensions, namely general learning, collaborative learning and constructive learning. Overall, this variable consists of 9 items using 5-point Likert scale ranging from strongly disagrees and strongly agree.

4. DATA ANALYSIS AND RESULTS

A summary of the means, standard deviations, reliability, and correlations is provided in Table 1.

Table 1: Descriptive Statistic, Reliability and Correlation

	Variables Constructed	α	Mean	SD	PEU	PU	Adoption	Benefits
1	Perceived Ease of Use (PEU)	0.874	4.11	0.694				
2	Perceived Usefulness (PU)	0.915	4.29	0.722	0.675**			
3	Adoption	0.889	3.19	1.09	0.114	0.154*		
4	Benefit	0.964	3.52	1.040	0.228**	0.248**	0.628**	

** $p<.01$ * $p<.05$

From table 1, it may be seen that all means for variables constructed ranging from 3.19 to 4.29 and standard deviation ranging from 0.694 to 1.09. The results revealed that mean for all variables higher that mid-point for all scales and Cronbach's alpha values were above .70.

Based on the intercorrelation of the variables in Table 1, PEU and PU have a strong and positive relation ($r=0.675$, $p<0.1$). PU ($r=0.154$, $p<0.05$) was positively correlated with Adoption. Adoption ($r=0.628$, $p<0.01$) have a strong positive relation with benefits. Result shows that there was no correlation between PEU and Adoption.

To test the study hypothesises for TAM variables, a multiple regression analysis was done. The R square for model in Table 2 was able to explained 2.4% of the variance in Adoption. The t-test for PU equals 2.15 and is statistically significant, $p < 0.05$. Therefore, PU can be used to explain Adoption.

Table 2: Regression results between TAM variables : Adoption, PEU and PU

Variables	*B*	*t*	*Sig*
Perceived Usefulness	0.233	2.15	0.033
Perceived Ease of Use	0.018	0.185	0.854

Dependent Variable : Adoption

For testing the hypothesis between Adoption and Benefit, a liner regression analysis was conducted. Base on regression result (Table 3), Adoption (R Square) was able to explain 39.4% of the variance in Benefit. Adoption showed highly significant relationship toward predicted variables where $p < 0.01$. It can be concluded that Adoption can be used to predict Benefit.

Table 3: Regression results between Adoption and Benefit

Variables	*B*	*T*	*Sig*
Adoption	0.602	11.088	0.000

Dependent Variable : Benefit

5. DISCUSSION AND CONCLUSION

The aims for study were to investigate relationship between TAM and benefits gained by users who adopted the technology.

5.1 Technology Acceptance Model (TAM)

For this study, there were three TAM variables constructed namely PEU, PU and Adoption. Result from this study revealed that only PU has significant relationship with Adoption. The result further explained that PU and Adoption displayed a positive correlation which indicated the higher perceived usefulness among student, the higher the adoption of the technology. This result from this study in line with previous study that reported PU has significant influenced toward Adoption (Vankatesh and Johnson, 2002). PU has a positive correlation towards PEU. The result also supported previous study by Park et all. (2009).

PEU do not have significant relationship with Adoption. A meta-analysis on TAM by Turner et all., (2010) reported that both PU and PEU were not able to predict the actual usage of new technology as good as BI. This situation explained by demographic factors of the students, where majority of them were senior years students (76.4%) from Faculty of Information Technology. Learning of new technologies was part of the practices as IT students. Hence, PEU was not influenced the adoption of the WCT.

TAM received various critics from previous researchers. Turner et all., (2010) reported that both PEU and PU were not able to predict the actual usage of the technology. While study conducted by Legris et al. (2003) revealed that PU and PEU only able to explain 40% of the technology usage. Previous studies agreed that other related variables should be included to increased influenced toward the technology usage (Legris et al., 200; Turner et al.,2010). Further research need to be conducted to identify other related variables, such as computer self-efficacy and

attitude, to be included in the study to improve factors influence adoption of new technology.

5.2 Adoption and Benefit

Previous researchers also revealed that the adoption of the technology correlated positively with the benefit on the learning performance (Cheung and Huang, 2005; Paschal, 2002; Goldman et. al., 2002; Chang and Tung, 2007). From the analysis conducted to examine the influence of adoption toward the benefit, the result exhibited that there was a significant relationship between adoption and benefit where adoption impacted positively toward benefit.

The result gained from this study in line with previous studies. Paschal (2002) in her study found that the adoption of wireless technology in class improved the performance of the student. These may explain by the better understanding of the students in class because they had chance to clarify the related information immediately in class. The similar result also reported by Goldman et al., (2002), where adopting of wireless classroom was able to improved the students' learning performance.

Adoption of the technology was able to provide benefits to the students in their general learning, collaborative learning and constructive learning. The measurement is suitable to be used in education setting that involved students as unit of analysis.

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