ANALYSIS OF USER ACCEPTANCE OF A NETWORK MONITORING SYSTEM WITH A FOCUS ON ICT TEACHERS

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ABSTRACT. The purpose of this study is to investigate the relationship between performance expectancy, effort expectancy, attitude, self-efficacy, anxiety and enjoyment (independent variables) towards behavioral intention (dependent variable) in using a network monitoring system. The study was conducted in 14 different schools and involved 30 ICT teachers as the respondents. Our findings rejected the null hypothesis as there were correlations between the independent variables and the dependent variable. Two constructs, namely, effort expectancy and enjoyment were determined to have a significant influence on usage behavior among ICT teachers in using the network monitoring system. Effort expectancy contributed 56.2% and, together with enjoyment, contributed 78% of the total variation observed in behavioral intention to accept and use the network monitoring system.

Keywords: UTAUT, flow theory, instant messaging, network monitoring, independent variable, dependent variable, ICT

INTRODUCTION

Network management has a significant role in the monitoring and management of computer networks in school computer labs. In our previous paper, we developed a monitoring system based on instant messaging using the XMPP protocol to monitor computer networks in school labs (Aziz, Ibrahim, & Sauti, 2015), since various studies had proved that the instant messaging technology is useful, easy and fun to use (Wei Wang, Hsieh, & Song, 2011; Zhou & Lu, 2011).

In the present study, we conducted a survey to investigate the factors that can influence usage behavior among ICT teachers in using the network monitoring system because previous studies have shown that most teachers have a positive attitude towards using technology (Ranjit Singh & Muniandi, 2012). Hence, the user acceptance was seen as a critical factor in identifying the successful implementation of the network monitoring system

The rest of this paper is structured as follows: Section 2 presents the research model and hypotheses; Section 3 presents the methodology; Section 4 summarizes the findings; Section 5 presents the discussion; and finally, Section 6 concludes by summarizing the perspectives of this work.
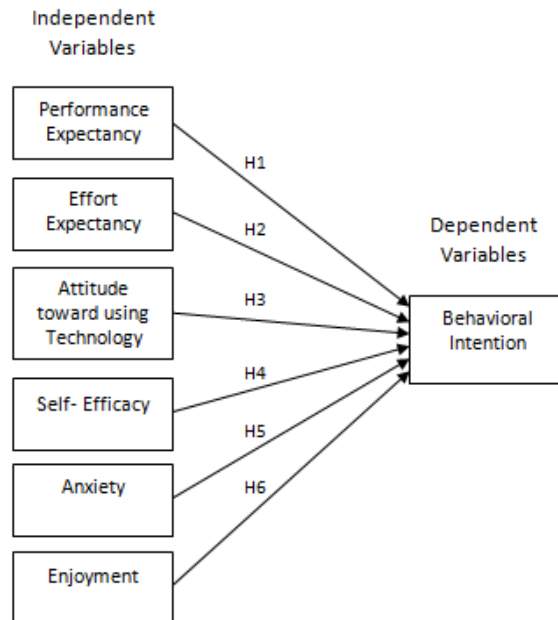
RESEARCH MODEL AND HYPOTHESES

This study aims to achieve three research objectives: 1) to identify whether there is a relationship between the independent variables and the dependent variable, 2) to identify whether the independent variables are significant predictors of the dependent variable, and 3) to identify the contribution of the independent variables to the dependent variable. All the constructs used in the research model were adopted from the variables used by Venkatesh et al. (2003), except the variable of enjoyment which was adopted from flow theory (Koufaris, 2002). The constructs for the independent variables are stated in Table 1.

Table 1. Operational definitions of the variables

Variable	Definition	Items
Performance expectancy (PE) (Birch & Irvine, 2009; Bourgonjon et al., 2010; Davis, 1989; Jong & Wang, 2009; Venkatesh et al., 2003)	The degree to which an individual believes that using the network monitoring system will help him/her perform monitoring tasks.	PE1: I would find the network monitoring system useful in my job. PE2: Using the network monitoring system enables me to monitor the network more quickly. PE3: Using the network monitoring system increased my productivity. PE4: If I use the network monitoring system, I will spend less time on routine job tasks.
Effort expectancy (EE) (Birch & Irvine, 2009; Bourgonjon et al., 2010; Davis, 1989; Venkatesh et al., 2003)	The degree of ease associated with the use of the network monitoring system.	EE1: My interaction with the network monitoring system is clear and understandable. EE2: It would be easy for me to become skillful at using the network monitoring system. EE3: I find the network monitoring system easy to use. EE4: Learning to operate the network monitoring system is easy for me.
Attitude towards using technology (AT) (Venkatesh et al., 2003)	An individual's positive or negative feelings towards using the network monitoring system.	AT1: Using the network monitoring system is a good idea. AT2: The system makes network monitoring more interesting AT3: Managing the network with the network monitoring system is fun. AT4: I like managing the network with the network monitoring system.
Self-efficacy (SE) (Venkatesh et al., 2003)	The individual's judgement about his/her ability to use the network monitoring system to complete a specific work or task.	SE1: I can manage the network by using this system if there is no one around to tell me what to do as I go. SE2: I can manage the network by using this system if I could call someone for help if I got stuck. SE3: I can manage the network by using this system if I had a lot of time to complete the job for which the software was provided. SE4:I can manage the network by using this system if have just the built-in help facility for assistance
Anxiety (AN) (Venkatesh et al., 2003)	Evoking anxious or emotional reactions when it comes to using the network monitoring system	AN1: I feel apprehensive about using the network monitoring system. AN2: It scares me to think that I could lose a lot of information using the system by hitting the wrong key. AN3: I hesitate to use the network monitoring system for fear of making mistakes I cannot correct. AN4: The network monitoring system is somewhat intimidating to me.
Enjoyment (EN) (Ibrahim, Khalil, &	The extent which the activity of the using net-	EN1: The actual process of using the network monitoring system is pleasant.

Jaafar, 2011; Koufaris, 2002; Lu, Zhou, & Wang, 2009; Wang et al., 2012)	work monitoring system is perceived to be personally enjoyable in its own right.	EN2: I have fun using the network monitoring system. EN3: Using the network monitoring system bores me.

The proposed hypothesized research model of the study is presented in Figure 1.

Figure 1. Proposed hypothesized research model

The regression equation of the model is expressed as Eq. (1):

$$\hat{y}_{BI} = b_0 + b_1(PE) + b_2(EE) + b_3(AT) + b_4(SE) + b_5(AN) + b_6(EN) \qquad (7)$$

The standardized regression equation of the model is expressed as Eq. (2):

$$Z_{\hat{y}\text{-}BI} = \beta_1 Z_{(PE)} + \beta_2 Z_{(EE)} + \beta_3 Z_{(AT)} + \beta_4 Z_{(SE)} + \beta_{5(AN)} + \beta_{6(EN)} \qquad (2)$$

METHODOLOGY

The participants were 30 ICT teachers from 14 schools in Wilayah Persekutuan Putrajaya and Selangor, Malaysia. The ICT teachers were chosen because they were responsible for managing the school computer lab and teaching ICT subjects in their school. The researcher was present to assist in using the network monitoring system and to ensure that the respondents understood the questions.

The questionnaire comprised 26 questions, with 23 questions on the independent variables (performance expectancy, effort expectancy, attitude, self-efficacy, anxiety and enjoyment) and three questions on the dependent variable (behavior intention). The questionnaire used a 4-point Likert scale, ranging from "strongly disagree" (1) to "strongly agree" (4).

FINDINGS

The data results were analyzed using SPSS 20. A stepwise regression analysis was used to determine whether the constructs (performance expectancy, effort expectancy, attitude, self-e,

anxiety and enjoyment) were significant predictors of the ICT teachers' intention to use the network monitoring system. The demographic data of the respondents are presented in Table 2. Most of the ICT teachers are female and 70% of the respondents had experience using the network management system. Table 3 presents the mean and standard deviation of all the study's variables.

Table 2. Distribution of ICT teachers' demographics (n =30)

	Factor	Frequency (n)	Percentage (%)
Number of Participants		30	100
Gender	Male	8	27
	Female	22	73
Experience using Network Management System	Yes	21	70
	No	9	30

Table 3. Descriptive statistics

Variable	N	Mean	Std. Deviation
Behavioral Intention (BI)	30	3.38	0.49
Performance Expectancy (PE)	30	3.54	0.46
Effort Expectancy (EE)	30	3.48	0.46
Attitude (AT)	30	3.66	0.43
Self-Efficacy (SE)	30	3.20	0.47
Anxiety (AN)	30	1.69	0.49
Enjoyment (EN)	30	2.80	0.37

The results from the correlation analysis, as presented in Table 4, show that all the independent variables were significantly correlated with the dependent variable; thus the null hypothesis (H_0) is rejected. The highest relationship found was between effort expectancy and behavioral intention.

H_0: Independent variables are not significant predictors of the dependent variable

Table 4. Correlation

Variable	Behavioral Intention (BI)
Performance Expectancy (PE)	0.654**
Effort Expectancy (EE)	0.750**
Attitude (AT)	0.567**
Self-Efficacy (SE)	0.538**
Anxiety (AN)	-0.355*
Enjoyment (EN)	0.697**

$*p<0.05; **p<0.001$

A one-way analysis of variance (ANOVA) was calculated, as presented in Table 5. The results indicated that only effort expectancy and enjoyment were significant predictors of behavioral intention ($F_{(2, 27)}=48.18$, $P<0.05$), thus leading to rejection of the null hypothesis (H_0).

Table 5. ANOVA results

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	5.34	2	2.67	48.18	0.00[c]
Residual	1.50	27	0.55		
Total	6.83	29			

c. Predictor: (Constant), Effort Expectancy, Enjoyment

The data in Table 6 show that the coefficients for effort expectancy and enjoyment were statistically significant, with effort expectancy (β=0.58, p<0.001) and enjoyment (β=0.50, p<0.001). This result indicates that effort expectancy and enjoyment were the relevant factors in the behavioral intention to use the network monitoring system.

Table 6. Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(constant)	-0.583	0.41		-1.43	0.16
Effort Expectancy	0.61	0.10	0.58	6.04	0.00
Enjoyment	0.66	0.13	0.50	5.20	0.00

The following regression equation and standardized regression equation resulted from the study:

$$\text{Refer Eq. (1): } \hat{y}_{BI} = -0.58 + 0.61(EE) + 0.66(EN)$$

$$\text{Refer Eq. (2): } Z_{\hat{y}BI} = 0.58Z_{(EE)} + 0.50Z_{(EN)}$$

In Model 1, effort expectancy was the strongest predictor of behavioral intention (56.2%). In Model 2, both effort expectancy and enjoyment contributed 78% of the total variation observed in behavioral intention to accept and use the network monitoring system. Table 7 presents the model summary.

Table 7. Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.75[a]	0.562	0.547	0.327
2	0.88[b]	0.781	0.765	0.235

a Predictors: (Constant), Effort Expectancy
b Predictors: (Constant), Effort Expectancy, Enjoyment

DISCUSSION

The study employed the UTAUT model and flow theory to determine the intention of ICT teachers to use the network monitoring system. The results from the data analysis based on the standardized coefficient showed that effort expectancy and enjoyment were statistically significant, with effort expectancy (β=0.58, p<0.001) and enjoyment (β=0.50, p<0.001), indicating that these are the relevant factors in the behavioral intention to use the network monitoring system. The study rejects the null hypotheses based on the existence of the correlation between the independent and dependent variables.

The results showed that the intention to accept and use the network monitoring system depended on two main factors; effort expectancy and enjoyment. The analysis done through ANOVA indicated that effort expectancy and enjoyment were significant predictors of behav-

ioral intention. In Model 1, effort expectancy was the strongest predictor of behavioral intention at 56.2%; while, in Model 2, effort expectancy and enjoyment contributed 78.1% of the total variation observed in behavioral intention to accept and use the network monitoring system. The remaining constructs (performance expectancy, attitude towards using technology and self-efficacy) also carried positive influence albeit less significant.

CONCLUSION

The study focuses on the factors that influence user acceptance of network monitoring system usage. Two different models, namely, the UTAUT (Venkatesh et al., 2003) and flow theory (Koufaris, 2002) were used as a research foundation as these models contain constructs that are closely linked to the network monitoring system context. The results showed that the intention to use the network monitoring system is highly probable because the system is easy to use, easy to learn, and pleasant and fun to use. Two independent variables, namely, effort expectancy and enjoyment, were found to be the most influential predictors of ICT teachers' acceptance of the network monitoring system. Apart from these two factors, the performance expectancy, attitude towards using technology and self-efficacy were also revealed to have a positive significant influence toward acceptance of the network monitoring system by ICT teachers.

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