

20. TEACHERS' ACCEPTANCE TOWARDS TECHNOLOGY SCALE VALIDATION

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Introduction

Computers are great invention that are used across discipline and education is one of the discipline that inculcate the use of computers through its' teaching and learning process. The use of technology in education is not something which is new but the usage of ICT in education has made a tremendous impact in the educational settings. Computer in education is regarded as a new innovation not in-term of the computer itself but the integration of computer in teaching and learning as well as administration. Being a new innovation, computers need to be accepted by teachers. In Roger's Diffusion of Innovation Theory (1960), for new innovation to be adopted, it must go through five stages of Innovation-Decision Process namely; Knowledge, Persuasion, Decision, Implementation and Confirmation. However this study will not address the acceptance of technology using Roger's theory but applying Davis's Technology Acceptance Model-TAM (1989). TAM posits that technology will be accepted (use) if it is perceived to be useful and requires less effort to use it (ease of use).

In ensuring that computers are accepted and implemented in school, the Ministry has formulated three policies as guideline for schools to implement the use of computers. The first policy states that ICT is for all students. This policy emphasize on the ICT as enabler to bridge the digital gap in the schools. The second policy emphasizes the role of ICT as teaching and learning tool, as part of the subject and as a subject by itself. Apart from the common radio and television as teaching technology, computers were given due attention as tools to gather information, keeping the information and disseminating the information. The third policy emphasizes on the use of ICT in administering the school through automate and mechanise work processes such as students profile, teachers profile, and examination marks and results (Fong Chan Mae, 2004).

While computers have been made available in most of the schools, little research is done to study on teachers' perception towards technology and how anxious they are when dealing with computers using TAM. A study by Ngah and Masood (2006) discussed on the issues relating to the diffusion and integration of ICT in classroom while Alias and Zainuddin (2005) studied the adoption of Learning Management System based on Concern Based Adoption Model. In Malaysia TAM has been used to study computers acceptance by small and medium sized company (Jantan, T.Ramayah & Chin, 2001), Internet shopping behaviour , and receptiveness of E-banking by Malaysian consumers (Koay, 2002). Fok (2001) incorporates self-efficacy in researching Internet acceptance among Malaysian while Ramayah, Dahalan and Mohamad and Siron (2002) incorporates gender, income and level of education into TAM in studying technology usage of managers in SME's in Malaysia.



Since the adoption of computers by teachers somewhat “force to” by the authority through the implementation of ICT Policy, teachers were not given a chance to express their feelings whether computers will give relative advantage to them and whether they are ready to use it. Teachers may find computers as added burden instead of being useful and even if it is useful, it may not necessarily easy for them to use.

Technology Acceptance Model

TAM, although originated in Information Studies field, has been widely tested in other areas. Previous research using TAM focuses more on measuring the attitude of users towards technology and the actual usage of the technology (Fusilier & Durlabhji, 2005; Schaper & Pervan, 2004). Spacey, Goulding and Murray (2004) studied the correlation between positive attitude and actual use of ICT among librarians. Positive attitude of the librarian has strong correlation with actual use of the Internet and intention to use the Internet. Money (2004) concluded that TAM can be used as a foundation to measure users’ acceptance of and actual use of new system, in his case the Knowledge Management System

Havelka (2003) on the other hand stated that students from both Management Information System major and Business major have the same positive attitude level towards technology indicating subject specialization does not influence students perception on the ease of use and the usefulness of technology.

Other study uses TAM in the context of social influence in technology acceptance. Social influences that generate a feeling of compliance to use the new system, seems to have negative influence on users’ attitude toward use of the new system. However, when social influences generate a feeling of internalization and identification on the part of the user, they have a positive influence on the attitude toward the acceptance of the new system (Malhotra & Galleta, 1999). Saade and Kira (2006) had in their research added affect and anxiety as other variables that impacted perceived usefulness and perceived ease of use of undergraduate students using web-based learning program.

The basic concept underlying User Acceptance Model are individuals reactions towards technology, how they perceived that the technology is beneficial to them and how easy can they use the technology. If individual reacted positively to the new technology, chances are they will use the technology but if their reactions are negative, they may avoid the technology. These positive or negative reactions created and intention to use or not to use the technology which later become the moderating factor in determining the actual use or no use of the technology.

Method

Participants

The population was student-teachers, pursuing Bachelor of Education at IIUM. These students are in-service teachers who were from various urban and rural schools (based on their last posting) with more than 2 years teaching experience. Questionnaires were distributed to all 406 students in semester 1, 2006/2007 which include both in-service





and pre-service cohort, thus employing sampling of convenient procedure. These students were enrolled to various programs namely; Teaching English as Second Language, Teaching Arabic as Second Language, Moral Education, Counselling and Educational Management. A total of 328 responses were returned. These responses were then subjected to data screening to eliminate incomplete data and 318 questionnaires deemed to be valid to be analyzed. Of the total 318 completed and valid responses, only 222 responses were analyzed as sample to the population leaving out 90 responses representing pre-service teachers. The sample is deemed adequate based on the general rule of 5 respondents per item (Hair, et.al., 1998) and based on the 21 items in the questionnaire, a sample of 105 is required for the study.

Measures

A pool of 21 items was selected from an instrument adopted and adapted from a research done by Kiraz and Ozdemir in 2006. Each item, suggestive of a specific dimension, to which the teacher indicates his or her response on a 7-point response scale, represents an indicator. Each indicator was worded in a manner to capture the meaning attached to one of the three dimensions, the underlying factors that explained the pattern of responses. Theoretically, the latent factor for the first five items was perceived usefulness, the subsequent indicators assessed the ease of use dimension and the next questions assessed the anxiety dimension.

The questionnaire was divided into two parts, Part A (variables on usefulness, ease of use, relative advantage and anxiety) and Part B (demographic). Kiraz and Ozdemir (2006) uses the items to measure the relationship between educational ideologies and TAM of Pre-service teachers at Middle East Technical University, Turkey. Respondents were asked to indicate their agreement or disagreement on a 7-point Likert scale with 1= strongly disagree to 7 = strongly agree.

To further establish the psychometric value of the teachers' acceptance of technology, the questionnaires were subjected to content-related validation. To content-validate the items, the instrument was administered to a purposive sample of 10 "judges" comprising of 5 lecturers and 5 PhD candidates. These judges were requested to validate and comment on whether the items would correspond to the underlying dimensions. Based on these comments, the items were reworded and included in the present study.

Data Analysis

To verify and validate the survey questionnaire, a confirmatory factor analysis (CFA) was conducted on the hypothesized three-factor structure model using Analysis of Moment Structure (AMOS; Arbuckle, 1989) model-fitting program. The program adopted maximum likelihood estimation to generate estimates in the full-fledged measurement model. Goodness of fit of the estimated model was evaluated using not only the Chi-square but also multiple descriptive indices. The present study reported the goodness-of fit index (GFI), comparative fit index (CFI), Tucker-Lewis Index (TLI) and root mean square of error approximation (RMSEA).



To assess the fit of the measurement model, the analysis relied on a number of abovementioned fit indices, which included the (1) minimum value of discrepancy between the observed data and the hypothesized model divided by the degree of freedom (CMIN/df), (2) goodness-of-fit indices; GFI, CFI and TLI. Arbuckle and Wothke (1995) pointed out that CMIN/df with the value of less than or between 2 and 5 is considered acceptable. The value of the indexes range from zero to I, which close to one demonstrating a good fit and a value of RMSEA of less than .08 shows a reasonable error of estimation.

Results

Hypothesized Model

Figure 1 presents the estimated three-common factor hypothesized model for teachers' acceptance to technology in their teaching and learning process. (n=222). Items from each scale are assumed to load only on their respective latent variables.

Figure 2 presents the measurement model with the loadings indicated on the arrow from the latent variables (factors) and observed variables. The reading on top right-hand corner of the observed variables are the squared multiple correlation (SMC). The SMC is the weightage or r^2 for each of the observed variable. While some of the overall fit indicators and parameter values are shown in the figure, the indicator reliabilities are summarized in the Table 1.

Figure 1 : Hypothesized model of Teachers' acceptance to technology.

(Q1 – Q24 represent observed variables; e1-e15 represent error variances; double headed arrows depicts correlations among factors; single headed arrow from the factors depict factor loadings)

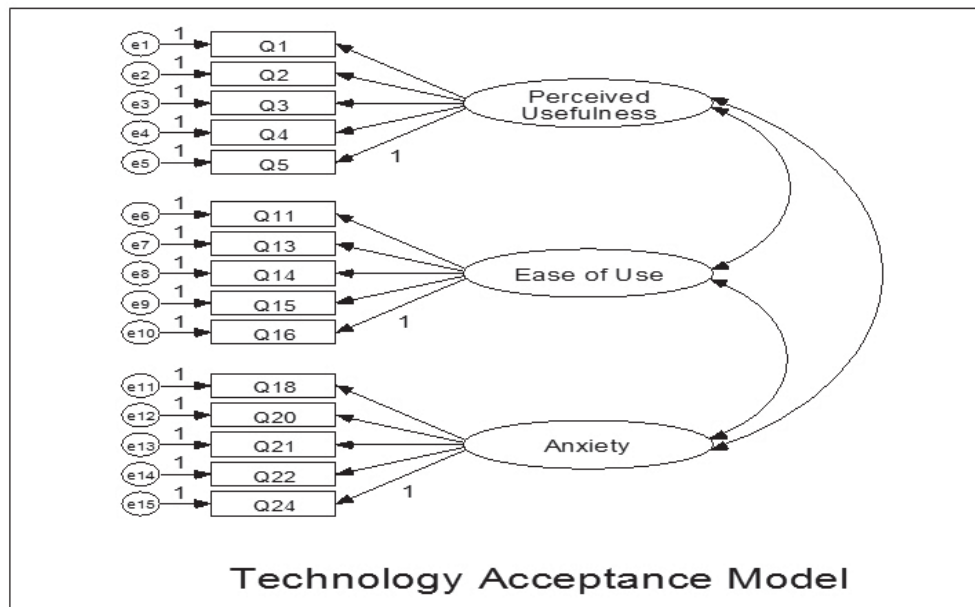
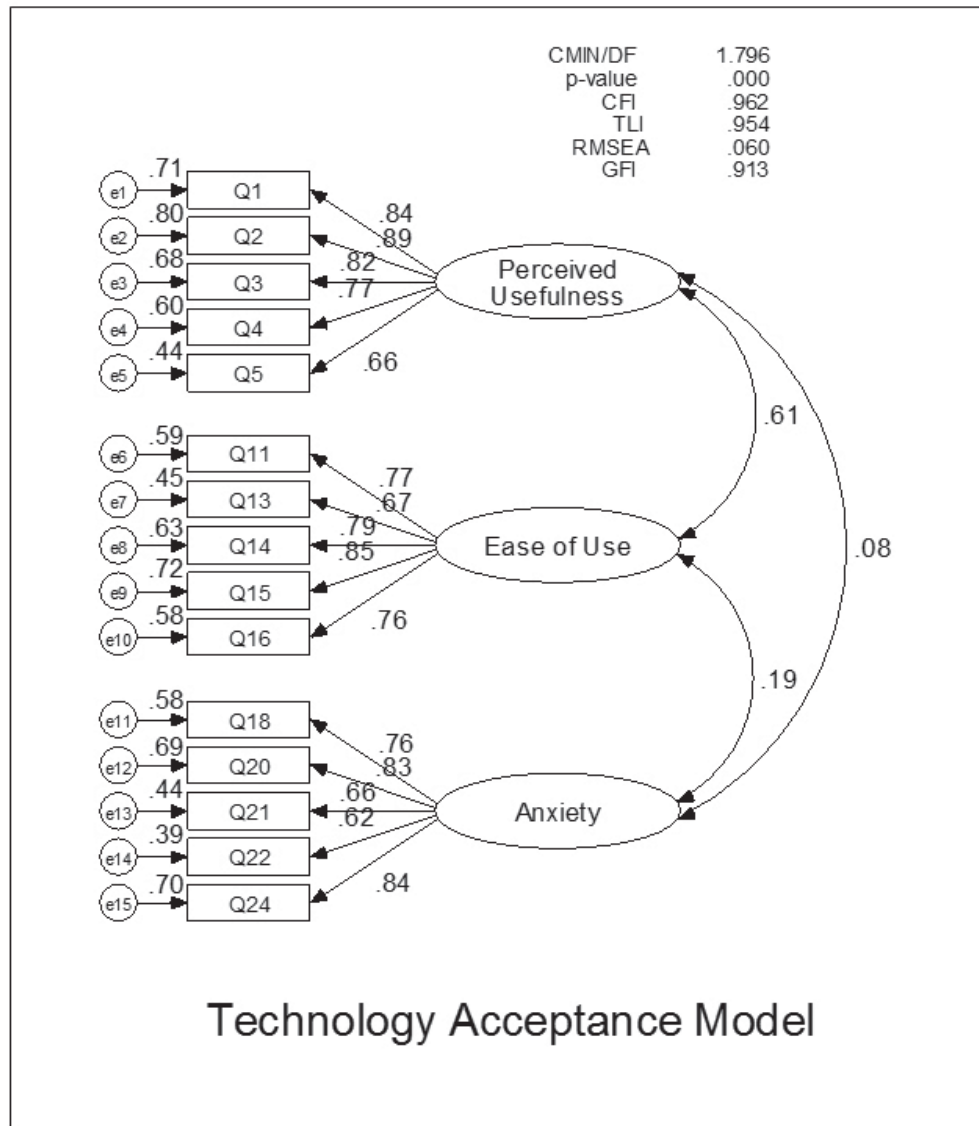


Figure 2: Measurement model of Teachers' acceptance to technology.

(Q1 – Q24 represent observed variables; e1-e15 represent error variances; double headed arrows depicts correlations among factors; single headed arrow from the factors depict factor loadings)



The results indicated that the parameters were free from offending estimates. Ranging from .66 to .89, the t-values of the factor loadings were greater than |2.0|, indicating statistically significant indicators. While the internal consistency estimate for perceived usefulness was .90, the other reliability indices were .88 (ease of use) and .86 (anxiety).

Table 1: Dimensions, Standardized Coefficient (loadings), Square Multiple Correlation (weightage) and α -reliability coefficient

Dimension	Item	Std. Coef.	S.M.C.	Reliability
Perceived Usefulness	Q1	0.84	0.71	0.90
	Q2	0.89	0.80	
	Q3	0.82	0.68	
	Q4	0.77	0.60	
	Q5	0.66	0.44	
Ease of Use	Q11	0.77	0.59	0.88
	Q13	0.67	0.45	
	Q1	0.79	0.63	
	Q15	0.85	0.72	
	Q16	0.76	0.58	
Anxiety	Q18	0.76	0.58	0.86
	Q20	0.83	0.69	
	Q21	0.66	0.44	
	Q22	0.62	0.39	
	Q24	0.84	0.70	

To validate the likelihood of the three-factor model, a confirmatory factor analysis was applied to the sample (n=222). The overall fit of the 15 items measurement model is summarised in Figure 2. The goodness-of-fit results indicate that the model is consistent with the data: that is, the measurement model did generate the observed covariance matrix accounted for 78% of the proportion of the variance explained.

The direction and magnitude of the factor loadings were substantial and statistically significant. The model is free from offending estimates and the internal consistency estimates satisfied the standard deem necessary in scale construction. The Cronbach's alphas for the sub-constructs in table 1 also showed an internal consistency.

Discussion

The purpose of the study was to validate the teachers' acceptance of technology as proposed in the literature and Technology Acceptance Model used by Kiraz and Ozdemir (2006). The study offered evidence that the three-dimension measurement model did generate the data collected from in-service teachers in Malaysia and yielded similar result even when exposed in different setting.

The result showed that there is a strong correlation between perceived usefulness and ease of use (.61) and moderate correlation between anxiety and ease of use (.19) as well as anxiety and perceived usefulness (.08). This finding implies that teachers' perception of computers' usefulness relates to their feeling of how easy to use computers. As they perceived how useful the computer is there are becoming less anxious in using it.

This study has implications for educational practices especially when assessing teachers' perception towards computers and technology. Since the 15-item three factor

structure yield a valid and reliable measurement model, the TAM scale, therefore, is useful in conducting a diagnostic assessment of teachers' perception towards computer usage and its technology. Results of assessment would enable teachers, educators and policy maker to design and implement intervention programs that could shape teachers' knowledge and skills in computer and telecommunication technology.

Theoretical and practical contributions of this study notwithstanding, our knowledge of teachers' perception on computers is far from perfect. Further research is required, especially in studying the impact of technology acceptance toward actual usage and how far the Malaysian government has been able to churn and yield successful adoption of billion of ringgit spent for technology upgrades and updates. More efforts are needed to examine the level of teachers' knowledge in using computers and its related technology. In summary, the present study can guide future efforts in enabling teachers to upgrade their level of computer literacy and competencies as to make the best of the emerging technology in a more meaningful learning environment.

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