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Examining acceptance of information technology: A longitudinal Study of Iranian high school teachers

Atefeh Ataran[1], Kolsum Nami[2]

[1]M.A. student of Adult Education of University of Tehran

[2]M.A. student of Educational Management of University of Tehran

Abstract. There is a growing recognition of the significance of information technology in education. However, resistance to the acceptance of technology by public school teachers' worldwide remains high and also fostering technology acceptance among individual educators remains a critical challenge for school administrators' technology advocates, and relevant government agencies. It is therefore of great importance to understand how and when teachers use computer technology in order to devise implementation strategies to encourage them This study examined the factors that influenced public school teachers' technology acceptance decision making by using a research model that is based on the key findings from relevant prior research and important characteristics of the targeted user acceptance phenomenon .This research model employs the current TAM as a basis and extends it by adding job relevance, education and subjective norm as external variables. The model was longitudinally tested using responses from more than 200 teachers attending an intensive 4-week training program on Microsoft PowerPoint, a common but important classroom presentation technology. The analysis of the collected data at the beginning and the end of the training supports most of our hypotheses and sheds light on the plausible changes in their influences over time. Results of the study are consistent with the TAM factors for explaining behavioral intention. The study also indicates that the job relevance and education have substantial influence on the teachers' technology acceptance. Theoretical and practical implications of the obtained results are discussed within the context of the education.

Keywords: adoption of information technology, teacher education, technology acceptance model, Structural equation modelling, IT adoption in education

1 University of Tehran, Educational sciences department, Tehran, Iran. Tel.: +989356054760.
E-mail address: Atefeh.Ataran@yahoo.com
2 University of Tehran, Educational sciences department, Tehran, Iran. Tel.: +989179471159.
E-mail address: Kolsum.Nami@yahoo.com

1. Introduction

Recent advances, especially in the area of computer technology, have heralded the development and implementation of new and innovative teaching strategies. Research has shown that teachers' perceptions and attitudes towards technologies influenced the effective use of these technologies in teaching and learning (Paraskeva; Bouta; & Papagianna, 2008). It is important for teachers to understand the precise role of technology in teaching and learning so that they can learn to cope effectively with the pressure created by the continual innovation in educational technology and constant need to prioritize the use of technology (Zhao, Hueyshan, & Mishra, 2001). Therefore, due to the importance of technology in education, pervasive technology acceptance by school teachers is required for realizing the technology-empowered teaching/learning paradigm advocated by visionary educators and IT professionals. However, resistance to the acceptance of technology by public school teachers worldwide remains high (Hwa-Hu; Clark; & Ma, 2003). In order to predict, explain and enhance technology acceptance and correspondingly increase utilization, Davis (1986) presented the original model of technology acceptance model (TAM) (Lee; Li; Yen; & Huang, 2010). The key purpose of TAM is to trace the impact of external variables on internal beliefs, attitudes, and intentions (Afari-Kumah; Achampong, 2010). Although the TAM has been extensively tested and validated among users in the business world, its application in education is limited. A possible reason for the relatively limited applications of the TAM in educational settings may be explained by the ways teachers interact with technology, compared to technology users in the business settings (Teo; B. Lee; Chai; Wong, 2009).This study examined the factors that influenced high school teachers' technology acceptance decision making by using a research model. The model was longitudinally tested by Iranian teachers attending an 4-week training program on Microsoft PowerPoint, which can greatly facilitate teachers' organizing, archiving, presenting, updating and sharing class materials (Alavi; Yoo; Vogel, 1997).

2. Research model and hypotheses

This research employs a model based on the current TAM (Davis ; Bagozzi; Warshaw, 1985) as a basis and tries to obtain a broader view of issues related to technology acceptance than has been included in previous research projects. This broader view included consideration of additional external factors such as job relevance, subjective norm and education as shown in figure1.

Perceived usefulness and perceived ease of use

Perceived usefulness (PU) is considered to be an extrinsic motivation for the user, and is defined as the degree to which a person believes that the use of a particular system can enhance work performance (Arteaga Sánchez,& A. Duarte Hueros ,2010). Perceived ease of use (PEOU) is the degree to which a person believes that using a particular system would be free of effort. A recent review found that these two variables received considerable attention in a great number of prior computer technology acceptance studies and were significant in both direct (PU) and indirect (PEOU) effects on intention to computer technology use (Legris; Ingham& Collerette,2003). Therefore we tested the following hypotheses:

H1: Perceived ease of use (PEOU) is positively related to perceived usefulness (PU).

H2: Perceived ease of use (PEOU) is positively related to intention to use (ITU).

H3: Perceived usefulness (PU) is positively related to intention to use (ITU).

Subjective norm

The subjective norm is the degree to which an individual perceives the demands of others on that individual's behavior (Ma; Anderson&Streith,2005). Findings from various studies show that classroom teachers' readiness to use technology will increase with strong support systems that include peers, communities, parents, business leaders and administrators (Kumar, Raduan Che Rose and Jeffrey Lawrence D'Silva). Accordingly, we tested the following hypotheses:

H4: Subjective norm (SN) is positively related to intention to use (ITU).

H5: Subjective norm (SN) is positively related to perceived usefulness (PU).

Job Relevance

Job Relevance measures to what extent the user believes that the system will be relevant for her job, in other words, will this system support the user's job-activities (Radeskog; Strömsted; Söderström, 2009). The effect of job relevance on perceived technology usefulness has also been examined (Hong; Thong. Wong& Tam, 2002) . Therefore, we tested the following hypotheses:

H6: Job relevance (JR) is positively related to perceived usefulness (PU).

Education

The decision to adopt a new technology is related to the amount of knowledge one has regarding how to use that technology appropriately (Rogers, 1995). Empirical studies also show a significant positive relationship between education level and perceived ease of use (Agarwal and Prasad, 1999). Therefore, we tested the following hypotheses:

H7: Education (E) is positively related to perceived ease of use (PEOU).

3. Methods

3.1. Participants and procedure

Participants in this study were 224 teachers who were enrolled at a teacher training program in Iran. They were informed of the purpose of this study and advised that they could retire their participation before or after they had completed the questionnaire. We examined longitudinally technology acceptance at the beginning and the end of training. This program includes training related to Microsoft PowerPoint that lasted for 4 weeks. Table 1 shows the profile of the participants.

3.2. Measures

To collect the data, we used a self-reported questionnaire Comprising two sections, the first required participants to provide their demographic information and the second contained 20 statements on the six constructs in our study. They are: perceived usefulness (PU) (three items), perceived ease of use (PEOU) (three items), intention to use (ITU) (two items), Subjective norm (SN) (four items), Job relevance (JR) (five items), and education (three items). Each statement was measured on a five-point Likert scale with 1 = strongly disagree to5 = strongly agree. The validity of the instrument was examined in terms of internal consistency (i.e. reliability) and convergent and discriminant validity (Straub 1989). Internal consistency was examined using Cronbach's α-value. All the constructs exhibited α-value greater than 0.86.This shows that all the constructs exhibited a high internal consistency with their corresponding measurement elements. Convergent and discriminant validities were examined by using principal component analysis of Varimax with Kaiser normalization rotation. The seven constructs exhibited both convergent validity (high factor loadings among items of the same component) and discriminant validity (low factor loadings across components). The total variance explained by the seven components was 78.19%. Therefore Results suggested that our instrument had encompassed satisfactory convergent and discriminant validity.

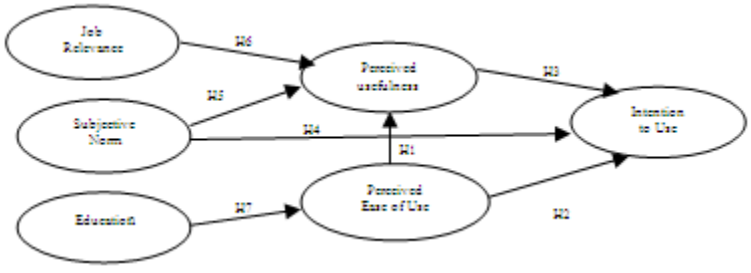


Fig.1: Research model.

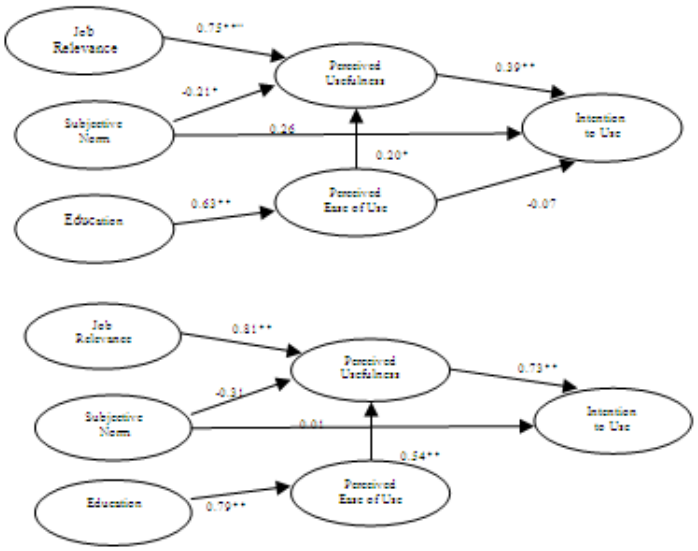
Table 1: Summary of respondents' characteristics

Demographic dimension		Training commencement (N=224)	Training completion (N=211)
Gender	Female	173(%77.23)	168(%79.62)
	Male	51(%22.77)	43(%20.38)

Average age(years)		37.7	37.4
Education level	2-year college degree	61(%27.23)	56 (%26.54)
	4-year college degree	121(%54.01)	119(%56.39)
	Masters	35(%15.62)	31(%14.69)
	Others	7(3.12)	5 (2.36)
Computer access	At home	173(%77.23)	168(%79.62)
	At work	51(%22.76)	49(%23.22)

4. Model testing results

A Structural Equation Modelling technique was used to test the model. The LISREL 8.3 program was employed for this purpose (Ma; Anderson & Streith, 2005). The overall fit of the resultant models was assessed using a number of goodness of fit indices representing absolute, comparative, and parsimonious aspects of fit, namely: $\chi 2/df$, Tucker-Lewis index (TLI), Comparative Fit Index (CFI), and Root Mean Squared Error of Approximation (RMSEA). A $\chi 2/df$ ratio less than 3.0 indicate good overall model fit (Marsh, Balla, & McDonald, 1988). To achieve acceptable fit, the TLI and CFI should be greater than .95 and the RMSEA should be equal or smaller than .06 (Hu & Bentler, 1999). Generally, our model exhibited an acceptable fit with the longitudinal responses collected. ($\chi 2/df$=2.472; TLI=.96; CFI=.97; RMSEA=.066). LISREL was used to perform the analysis the testing hypotheses. Figure 2 shows the resulting path coefficients of the research model at Training Commencement and Training Completion. Based on the responses from both data collections, (PU) had a significant direct positive effect on teacher's intention to PowerPoint use, with standard path coefficient increase from 0.39 to 0.73 ($p<0.0001$). (PEOU) had positive effects on both (PU) (path coefficient from 0.20 to 0.54) (ITU) (path coefficient from 0.15 to 0.18). Although it is a significant direct effect on (PU) but its effect on (ITU) is statistically non-significant. The responses from data collections at Commencement training supported subject norm's effect on (PU) but, interestingly, was not supported by those from training completion with standard path coefficient decrease from -0.21($p<0.05$) to- 0.31 ($p<0.01$). Based on responses from both data collections, (JR) consistently was the most important determinant of (PU), showing a path coefficient of 0.75 and 0.81($p<0.0001$). Also responses from both data collections supported education's effect on teacher's (PEOU), with standard path coefficient increase from 0.63 to 0.79 ($p<0.0001$). Overall, the responses collected at training commencement and completion supported most of our hypotheses. Theoretical and practical implications of the obtained results are discussed within the context of the education.



* P < 0.05; ** P < 0.0001

Fig. 2: Model testing results at training commencement and training completion.

5. Discussion

This study attempts to examine the factors that influenced user's technology acceptance in an educational context by using a research model among high school teachers in Iran. In examining the relationships among the TAM factors, this study found that (PU) and (PEOU) were key determinants of intention to use. It is to be noted that path PEOU ITU in this study does not support the results of Davis et al. (1989). Therefore, school administrations should devise implementation strategies to exhibit computer technology use in teaching process is comfortable and it could improve instructional performance. The study also indicates that among external factors proposed, the job relevance and education have substantial influence on the teachers' technology acceptance. According to our findings, effective training would affect teachers' perceived ease of use of computer technology and technology's relevance to routine classroom activities influence on teachers' perceived technology usefulness. This would probably be one of the most important issues that school administrations need to consider in the future educational planning. In the model testing analysis, it was found that teachers' subjective norm did not have any direct or indirect significant effect on their intention towards computer technology use .One explanation could be as Jedeskog (1998) suggested that it was the individual teacher who decided when computer technology became part of the curriculum(Ma ;Anderson&Streith,2005) The results of such study would inform school administrators, technology advocates, and relevant government agencies to devise implementation strategies to encourage acceptance technologies relevant teaching at the teacher training stage.

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