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Empirical Evaluation of the End User Attitude (EUA) Toward Use of Information Technology

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Abstract: This study proposed a revised technology acceptance model for measuring End User Attitude (EUA) toward use of information technology. An empirical study was conducted to collect data. This data was empirically used to test the proposed research model. The structural equation modeling technique was used to evaluate the causal model and confirmatory factor analysis was performed to examine the reliability and validity of the measurement model. The results demonstrate that the model explains 73% of the variance. This findings contributes to an expanded understanding of the factors that promote EUA toward use of information technology. The implication of this research to both researchers and practitioners is discussed.

Key words: End user attitude, technology acceptance model, computer self-efficacy, management support, computer competence, computer anxiety, cultural perception

INTRODUCTION

With the recent growth of practical information technology in such areas such as universities and schools, the topics of End User Attitude (EUA) toward use of information technology deserve careful attention. Today, educational employees are increasingly using sophisticated tools to develop their own information technology to help them efficiently manage work. End User Attitude (EUA) toward use of information technology has been established as one of the critical success factors in achieving educational success.

It is becoming a fundamental part of the educational plan. End User Attitude (EUA) toward use of information technology is one of the most widely researched topics in the information field. Here, the EUA is defined as the attitudes are feelings people have and the evaluations they make toward some object, person, issue or event and use of information technology by personnel who are working in schools to develop software and hardware applications in support of educational tasks.

The Reasoned Action theory (TRA) is a well established model and has been broadly used to predict and explain human behavior in various domains. Davis proposed the Technology Acceptance Model (TAM) derived from TRA that has been tested and extended by numerous empirical researches. As Davis (1989) pointed out, the original TAM model consists of Perceived Ease Of Use (PEOU), Perceived Usefulness (PU), attitude Toward Using (AT), Behavioral Intention to use (BI) and Actual system Use (AU). TAM has been proven for its validity and ability to adequately explain end user System Usage (SU).

Igbaria *et al.* (1997) pointed out that the model variables in their study only explained 25% of the variance in system usage and suggested that further research should incorporate other variables into the model. In addition, some other EUA researches using TAM are shown in Table 1. Table 1 shows that none of the explained variance for the model is above 66%. Comprehending the essentials of what determines EUA can provide great management insights for promoting EUA. Therefore, this research adopts the TAM from Igbaria *et al.* (1997) and integrates it with management support, computer competence, computer anxiety, cultural perception and computer self-efficacy variables to investigate what determines EUA. The proposed model is then evaluated.

Theoretical background: Since, 1986 TAM has been used worldwide in the business information technology and education settings. Many researchers have tested replicated and extended TAM with additional constructs (Cheung and Huang, 2005; Drennan *et al.*, 2005). Therefore, TAM has been developed over time within different populations and with various technology systems. The Technology Acceptance Model (TAM) was developed by Davis at a time when user attitudes were discovered as a crucial factor in information system project success (Davis, 1993; Swanson, 1988), a

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Table 1: Prior ATM for EUA

Reference	Model	The explained variance of the model (%)
Lu *et al.* (2009)	Perceived ease of use → Perceived usefulness	62.0
	Perceived usefulness → Attitude	
	Perceived enjoyment → Attitude	
Reynolds (2008)	Computer self-efficacy → Attitude	47.6
	Performance expectancy → Attitude	
	Effort expectancy → Attitude	
Tan (2007)	Perceived ease of use → Perceived usefulness	45.5
	Perceived usefulness → Attitude	
	Perceived enjoyment → Attitude	
Porter and Donthu (2006)	Perceived ease of use → Perceived usefulness	66.0
	Perceived ease of use → Attitude	
	Perceived access barriers → Attitude	
Schepers and Wetzels (2007)	Subjective norm → Attitude	
	Perceived usefulness → Attitude	
	Perceived enjoyment → Attitude	47.0

development which Davis asserts still continues today. The TAM, now a popular and much studied theoretical model was developed from the general social psychology theory, the Theory of Reasoned Action developed by Fishbein and Ajzen (1975).

Many studies have found that the perceived usefulness and perceived ease of use are important determinants in predicting intentions of actual computer use (Igbaria *et al*., 1997; Lu *et al*., 2003; Drennan *et al*., 2005). The purpose for the studies was to determine the individual intention of use as opposed to use due to organizational mandate. The results of the studies have shown that perceived usefulness and perceived ease of use have a high ability to predict the intention to use computer systems. Wu *et al*. (2007) pointed out that TAM posits that user adoption of a new information technology is determined by the users' intention to use the system which in turn is determined by the users' beliefs about the system. Heijden (2003) described the TAM as a parsimonious, theoretically and empirically justified model intended to explain the acceptance of information systems. TAM is a popular model for explaining the behavior of technology users (Heijden, 2003). The TAM deals directly with issues regarding the implementation of new technology. Strength of the TAM is that it is simple and easy to apply to many situations. The TAM is designed to explain technology acceptance on an individual level in wide user populations and to explain the contexts with which technology is used (Hu *et al*., 2003).

TAM further suggests two beliefs; perceived usefulness and perceived ease of use are instrumental in explaining the variance in users intention. Perceived usefulness is defined as the extent to which a person believes thatusing a particular system will enhance his or her job performance. Perceived ease of use is defined as the extent to which a person believes that using a particular system will be free of effort. Among these

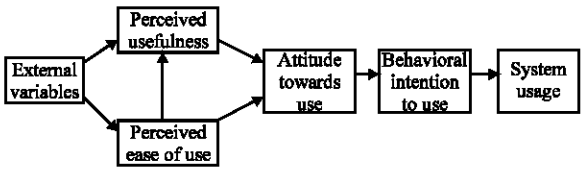

Fig. 1: Technology Acceptance Model (TAM)

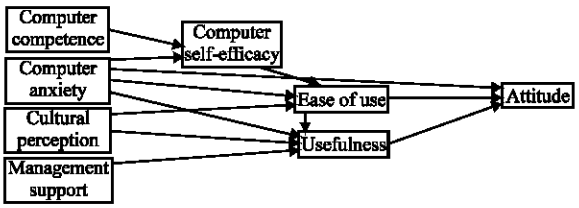

Fig. 2: Hypothesized research model for End User Attitude (EUA)

beliefs, perceived ease of use is hypothesized to be a predictor for perceived usefulness. Furthermore, both types of beliefs are influenced by external variables. The model is shown in Fig. 1.

Base on previews literature review, there are five important external variables: management support, computer competence, computer anxiety, cultural perception and computer self-efficacy. In this study these constructs defined as EUA model. The researcher proposed that variables except computer anxiety would have a positive impact on end user attitude toward use of information technology. The EUA model is shown in Fig. 2.

Conceptual model and research hypotheses: TAM offers a promising theoretical base for examining the factors contributing to EUA model. This research adopted the TAM from Ma and Liu (2004) and integrated it with the management support, computer competence, computer anxiety, cultural perception and computer self-efficacy

variables to investigate what determines EUA toward use of information technology. The revised TAM is shown in Fig. 2.

Hypothesized research model illustrated to provide an even stronger model than earlier standing alone. For instance, TAM focuses on attitudes toward using a particular IT that users develop based on perceived usefulness and ease of use. EUA focuses on the supportive management of end users to change their attitudes to use more information technology and support a task and match the user's tasks needs with the available IT functionality. This study links EUA with TAM to explain the EUA model. Therefore, the EUA is integrated in the model.

Workplace settings focus on productivity rather the assessment of an individual's performance outcomes and technological perceptions. TAM is a useful model because it allows researchers to locate the causes of technology resistance by focusing on behavioral constructs. Tung and Chang (2007) created an extended TAM which included computer self-efficacy and computer anxiety to explain adolescent technology acceptance. The research showed that computer self-efficacy had a powerful impact on the behavioral intent of adolescents to use online learning. Computer anxiety had a negative impact on computer self-efficacy and ultimate intent to use the program.

The TAM posits attitudes toward using the system are predicted from two factors which represent user beliefs and attitude, perceived usefulness and perceived ease of use (Agarwal and Prasad, 1999; Morris and Dillion, 1997). Intended as a practical model, the TAM, theorized that a persons perceived ease of use (E), perceived Usefulness (U), Attitude (A), Behavioral Intention (BI) could be developed to show a general parsimonious model of user behavior across many types of technologies and varied populations. Computer self-efficacy represents an individual's perceptions of his or her ability to use computers in the accomplishment of a task (Chalmers, 2003; Compeau and Higgins, 1995). Research has highlighted the importance of teachers computer competency in order to utilize computers as an educational tool in their classrooms (Hardy, 1998; Knezek and Christensen, 2000; Siegel, 1995). Managers play a significant role in preparing and supporting staff for the implementation of the new technology. Management support has in fact been studied in conjunction with TAM and has appeared to be of importance in an individual's decision process on whether or not to accept a technology (Ford *et al*., 2003). Three Meta-analyses (King and He, 2006; Legris *et al*., 2001; Ma and Liu, 2004) agree the TAM is a robust theoretical model to explain and understand acceptance of technology. Based on Fig. 2, the following hypotheses are proposed:

H1: Perceived usefulness will be positively related to attitude toward use of information technology.

H2: Perceived ease of use will be positively related to perceived usefulness (H2a) and attitude toward use of information technology (H2b).

H3: Computer self-efficacy will be positively related to perceived ease of use.

H4: Computer competence will be positively related to computer self-efficacy.

H5: Computer anxiety will be negatively related to computer self-efficacy (H5a), attitude (H5b), perceived ease of use (H5c) and perceived usefulness (H5d).

H6: Cultural perception will be positively related to perceived ease of use (H6a) and perceived usefulness (H6b).

H7: Management support will be positively related to perceived usefulness.

MATERIALS AND METHODS

Measurement development and pilot study: To ensure that a comprehensive list of scales was included, research by previous researchers were reviewed. In the revised model, the construct for end user computing was based on the study by Brancheau and Brown (1993). Measure for perceived usefulness was based on Venkatesh and Davis (2000). Perceived ease of use was adapted from previous studies on TAM (Davis, 1989). Measure for attitude was based on Albirini (2006). The measure for computer self-efficacy was based on Thatcher and computer anxiety was adapted from the research by Venkatesh *et al*. (2003). The construct for cultural perception and computer competence were based on Zeinab. The measure for management support was refined based on the prior research (Igbaria *et al*., 1997).

Researcher conducted a pilot study to examine the comprehensibility of the translated questionnaires and their capability of eliciting valid responses and to establish the reliability of the instruments. A pilot test was administered on 10% of the population not selected for participation in the research. About 25 persons responded to the pilot study in five participating schools and high schools in Iran. The pilot test involved giving self-administered questionnaires to the participants. These

Table 2: Definition of the variable

Construct	Definition	References
Attitude	Attitudes are feelings people have and the evaluations they make toward some object, person, issue or event	Fishbein and Ajzen (1975)
Perceived usefulness	The degree to which a person believes that using a specifiic application system will increase his or her job performance within an organization context	Davis (1989)
Perceived ease of use	The degree to which a person believes that using computer technology would be free of effort	Davis (1989)
Computer self-efficacy	Computer self-efficacy represents an individual's perceptions of his or her ability to use computers in the accomplishment of a task	Compeau and Higgins (1995)
Computer anxiety	Evoking anxious or emotional reactions when it comes to performing a behavior (e.g., using a computer)	Venkatesh *et al.* (2003)
Management support	The perceived level of general support offered by top management	Venkatesh and Davis (2000)
Cultural perception	The degree to which an innovation is perceived as being consistent with the existing values, past experiences and needs of potential adopters	Rogers (1995)
Computer competence	In order to utilize computers as an educational tool in their work	Siegel (1995)

respondents were selected to ensure that the persons have similar characteristics to the respondents in the target population. These questionnaires were distributed to the respondents and were collected a week later.

All measurements were originally developed in English and translated into Farsi. The purpose of the pilot test was to further validate the instrument for content and clarity of instructions, determine whether the chosen statistical methods were appropriate and to estimate the expected response rate. In the Iranian context, the wording in the Persian version was refined as a result of the pretest. The questionnaire consists of 84 items measuring the 8 latent variables. Table 2 shows the definition of each variable. The finalized questionnaire was sent to the subjects at the 30 schools and high schools, randomly selected from the 72 schools. The subjects were the administrators and their deputies, clerks and querist-teachers in each school.

Table 3: Demographic characteristics of the sample

Variables	Percentage
Gender	
Male	38.8
Female	61.2
Age	
>26 years	36.7
<25 years	20.0
25-30	24.0
31-35	28.0
36-40	14.0
>41 years	8.0
Missing	26.5
Educational level	
Diploma degree	8.1
Bachelor degree	71.4
Master degree	20.4
Tenure	
<14 years	6.1
15-20 years	28.6
21-25 years	28.6
School hierarchy	
Elementary school	36.7
Guidance school	26.5
High school	36.7

RESULTS AND DISCUSSION

Descriptive statistics: The researcher distributes two hundred questionnaires and received 165 returned questionnaires. Seventeen gave incomplete answers and were dropped. One hundred forty seven were left for the statistical analysis. The data indicates that the majority of respondents had a college education. Nearly 40% of the respondents had experience using computers every day. The demographic characteristics of the sample are shown in Table 3. How respondents do their jobs with computer and with what software are shown in Table 4. The data indicates that the major respondents do not use software nearly half percent of respondents. The most frequently used software is Microsoft word. Subjects have multiple choices over the way they perform their job and the software. Nearly 60% of respondents have not any email address. They use computer and internet just for web surfing.

The proposed research model was evaluated using Structural Equation Modeling (SEM). The data obtained were tested for reliability and validity using Confirmatory Factor Analysis (CFA). This step tested if the empirical data confirmed to the presumed model. The CFA was computed using the AMOS software. In CFA, factor loadings can be viewed as regression coefficients in the regression of observed variables on latent variables. The internal consistency of a test was considered adequate when its reliability coefficients exceeded the 0.7 level (Fornell, 1982). Cronbach's alpha for all variables were above 0.7 (Table 5). The reliability was estimated to evaluate the internal consistency of the measurement model. The reliabilities of the measures included in the model ranged from 0.80-0.97 (Table 5). This illustrates that all measures had strong and adequate reliability. These values were expected as nearly all constructs were taken from well-established instruments with high reliability scores from previous studies.

Structural model results: The measurement model test presented a good fit between the data and the proposed measurement model. For instance, the Comparative Fit Index (CFI) value was 0.93, represents a very well fits for the model (Table 6).

According to Browne and Cudeck (1993), an RMSEA value of 0.05 indicates a close fit with a value of up to 0.08 represents a reasonable fit. The various goodness of fit statistics are shown in Table 6. Overall, the results showed that the measurement model exhibits a very good level of fit based on the assessment criteria such as χ^2/df, GFI, NFI, TLI, CFI and RMSEA. In addition, the explained variance in computer self-efficacy, perceived ease of use, perceived usefulness and attitude were 62, 34, 83 and 73%, respectively. This means that the model explains 73% of the attitude variance which is higher than the measured value in prior researches (Lu *et al*., 2009).

Figure 3 shows the results from the final structural model including the estimated path coefficients. The structural equation modeling results indicate hypotheses H2b and H5d were statistically significant but not in the hypothesized direction and hypothesis H5c was not statistically significant. Consistent with Hypotheses 1, perceived usefulness was positively related to attitude (H1:c = 0.92, p<0.001). The data shows Hypotheses 2a, perceived ease of use was positive related on perceived usefulness (H2a:c = 0.30, p<0.001) but Hypotheses 2b, perceived ease of use was not positively related on attitude (H2b:c = -0.15, p<0.01). Hypotheses 3, computer self-efficacy was positively related to perceived ease of use (H3:c = 0.35, p<0.001). Hypotheses 4, computer competence was positively related to computer self-efficacy (H4:c = 0.53, p<0.001). The data also confirms that hypotheses 5 (H5a,b) Computer anxiety was negatively related to computer self-efficacy (H5a:c = -0.42, p<0.001) and was negatively related to attitude (H5b:c = -0.32, p<0.001) but hypothesis 5c, relationship between computer anxiety and perceived ease of use was not statistically significant. Computer anxiety was positively related to perceived usefulness (H5d:c = 0.14, p<0.001). Consistent with Hypotheses 6 (H6a and H6b), cultural perception was positively related to perceived ease of use (H6a:c = 0.42, p<0.001) and perceived usefulness (H6b:c = 0.67, p< 0.001). Hypotheses 7, management support was positive related on perceived usefulness (H7:c = 0.16, p<0.001). The summary of findings is shown in Table 7.

In this study, the researcher successfully tested and used the EUA model in an education setting. The EUA was designed to measure employee attitude regarding information technology. The EUA model was designed based on the TAM, a well-known model because it has been useful in predicting an end-user's acceptance or rejection of technology. The literature supports attitude as a determining factor in the acceptance of technology.

Table 4: Application for EUA

Application	Percentage
Computer usage	
Everyday	38.8
3 times week^{-1}	16.3
1 time week^{-1}	30.6
1 time month^{-1}	10.2
Never	4.1
Microsoft word usage	
Everyday	8.2
3 times week^{-1}	22.4
1 time week^{-1}	16.3
1 time month^{-1}	22.4
Never	30.6
Microsoft excel usage	
Everyday	4.1
3 times week^{-1}	6.1
1 time week^{-1}	6.1
1 time month^{-1}	28.6
Never	55.1
Microsoft powerpoint usage	
Everyday	0
3 times week^{-1}	6.1
1 time week^{-1}	10.2
1 time month^{-1}	26.2
Never	57.1
Email usage	
Everyday	4.1
3 times week^{-1}	18.4
1 time week^{-1}	8.2
1 time month^{-1}	12.2
Never	57.1
Internet usage	
Everyday	30.6
3 times week^{-1}	16.3
1 time week^{-1}	22.4
1 time month^{-1}	16.3
Never	14.3

Table 5: Means, standard deviations, correlation and cronbach's alpha of latent variables

Variables	M	SD	1	2	3	4	5	6	7	8
Computer competence	39.77	10.99	(0.88)	-	-	-	-	-	-	-
Computer anxiety	9.45	4.70	-0.376**	(0.85)	-	-	-	-	-	-
Cultural perception	58.10	11.22	0.307**	-0.150	(0.84)	-	-	-	-	-
Management support	19.40	5.99	0.225**	0.042	0.316**	(0.87)	-	-	-	-
Computer self-efficacy	22.83	7.95	0.689**	-0.614**	0.248**	0.096	(0.90)	-	-	-
Ease of use	13.08	3.99	0.393**	-0.287**	0.500**	0.113	0.455**	(0.80)	-	-
Usefulness	39.32	11.54	0.334**	-0.045	0.858**	0.417**	0.222**	0.624**	(0.97)	-
Attitude	73.51	16.66	0.250**	-0.306**	0.756**	0.192*	0.362**	0.494**	0.812**	(0.92)

**Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed). Cronbach's alpha illustrated in ()

Table 6: Goodness of fit measure of the research model

Goodness of fit measure	Recommended value	Research model
X^2/df	<5	4.22
GFI	>0.90	0.93
NFI	>0.90	0.93
IFI	>0.90	0.95
TLI	>0.90	0.88
CFI	>0.90	0.94
RMSEA	<0.08	0.10

Table 7: Summary of findings

Hypothesis	Independent variable	Dependent variable	Supported
H1 (+)	Perceived usefulness	Attitude	Yes
H2a (+)	Perceived ease of use	Perceived usefulness	Yes
H2b (+)	Perceived ease of use	Attitude	No
H3 (+)	Computer self-efficacy	Perceived ease of use	Yes
H4 (+)	Computer competence	Computer self-efficacy	Yes
H5a (-)	Computer anxiety	Computer self-efficacy	Yes
H5b (-)	Computer anxiety	Attitude	Yes
H5c (-)	Computer anxiety	Perceived ease of use	NS
H5d (-)	Computer anxiety	Perceived usefulness	No
H6 (+)	Cultural perception	Perceived ease of use	Yes
H7a (+)	Cultural perception	Perceived usefulness	Yes
H7b (+)	Management support	Perceived usefulness	Yes

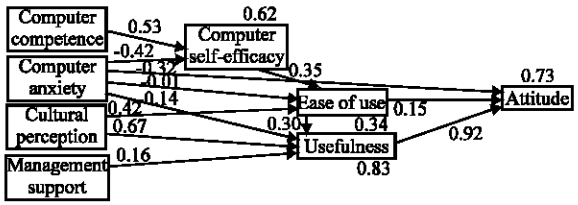

Fig. 3: The empirical results of this study

Employees' attitudes toward using information technology was predicted by perceived usefulness ($\beta = 0.92$). Perceived usefulness of information technology was a more influential predictor to employees' attitudes toward using than perceived ease of use. Based on the results of structural equation modeling analysis, all of the model fit indices were within the normal range. Therefore, the EUA in this study appears to adequately specify the attitude of employees to use information technology. In terms of prediction in agreement with the original TAM and previous studies (Adams *et al*., 1992; Chau, 1996; Davis *et al*., 1989; Hu *et al*., 1999), perceived usefulness was found to be a key determinant that has a statistically significant and strong influence on employees' attitude to use information technology. This may claim that employees in schools tend to focus on the usefulness of information technology rather than ease of use. In fact, the most motivating reason for employees to use IT was its usefulness. In this study, employees' attitude was not significantly impacted by perceived ease of use. The TAM has emphasized the importance of usefulness over ease of use as the key determinant of intended usage; however, usefulness is expected to be influenced by ease of use. This result is consistent with the finding from prior research (Wu *et al*., 2007). The support from administrators as an external variable from this study showed a significant influence on perceived usefulness.

The relationship between the factors, management support and usefulness (Effectiveness and importance of information technology) may suggest a need for management to support the use of IT for educational purposes. This suggests that organizations should enhance the computer environment for the end user to promote and change their attitude about use of information technology. Computer self-efficacy significantly, positively and directly affected PEOU. These findings support previous research which found that CSE is likely to influence beliefs and behavior. The prior studies have found a positive effect of computer self-efficacy on both of the belief components: PU and PEOU (Igbaria and Iivari, 1995; Shish, 2006) they introduced computer self-efficacy as a factor affecting PEOU and IT usage and supported that once a person's belief is strong that he has the capability to perform a particular behavior, it affects both PU and PEOU components and is strongly linked with IT usage. Like prior research of Venkatesh and Davis (2000), computer self-efficacy was determinant of PEOU of information technology. Hackbarth *et al*. (2003) found that CA had a negative influence on perceived ease of use. Employees with high degree of computer self-efficacy are more likely to have high degree of perceived ease of use (Hong *et al*., 2002).

Computer self-efficacy had significant positive impact on perceived ease of use. It provides evidence that H3 is supported. Almost two thirds of the participants in this investigation used the Internet. A high percentage (70%) of the respondents stated that they have competence in using the worldwide web. Likewise, a limited number of the respondents reported that they were able to use Microsoft office with much competence. A low relationship was found between respondent attitudes and their level of computer competence ($r = 0.25$, $p<0.01$). A considerable positive relationship was found between respondent computer competence and their level of computer self-efficacy ($r = 0.69$, $p<0.01$). Saade and Kira (2006) found computer anxiety to have a moderating influence on perceived ease of use and perceived usefulness. According to literature, it seems researchers generally agree that computer anxiety plays an important role in technology acceptance among instructors (Korukonda, 2006). In an empirical study, Saade and Kira (2006) found that computer anxiety had a moderating influence on both perceived ease of use and perceived usefulness. Computer anxiety demonstrated a direct,

statistically significant, negative relationship with computer self-efficacy ($c = -0.42$, $p<0.01$) individuals who experienced more computer anxiety were less likely to report high levels of computer self-efficacy, thus supporting Hypothesis 5a. Base on Jones and Maloy (1996) cultural perceptions is embody group understanding based on common beliefs and values (p. 25). A number of studies have shown that cultural perceptions toward different computer-related technologies are key factors related to both the initial acceptance of these technologies as well as future behavior regarding their usage (Loch *et al*., 2003; Albirini, 2004). Unfortunately however, only a few studies have tried to study the impact of cultural perceptions on the reception/rejection of IT in education (Albrini, 2004).

CONCLUSION

This study proposed a revised TAM that adopted the TAM, from Igbaria *et al*. (1997) and integrated it with computer self-efficacy, computer competence, computer anxiety, cultural perception and management support variables to investigate what determines EUA toward use of information technology. The results showed that perceived usefulness, perceived ease of use and computer anxiety all directly influence employees attitude toward IT. The essential determinant for attitude is perceived usefulness of computer. The TAM can potentially be a helpful tool in educational settings to understand employees' attitude toward use of information technology. The EUM Model fit the data from the sample very well. This lends support to the use of the model to explain and predict acceptance of information technologies. I found support for the theory that users who are more experienced with these types of systems find them easier to use. They also found it to be more useful. With high computer self-efficacy, employees would feel the information technology is easy to use and would have more usage of IT. When individuals have experiences that build their mastery of IT applications and are in an environment with positive management support, they tend to have higher levels of computer self-efficacy; high computer self-efficacy in turn is associated with usage of information technology. In a meta-analysis of several TAM research, Legris *et al*. (2001) found that TAM typically explains about 40% of the reasons for a system's usage. EUA model explains 73%. Therefore, the model shows more strength in the Iranian cultural setting. Studying educational employees' cultural perceptions is particularly important in developing countries where IT is not usually part of the culture. Due to its novel presence in society at large and in schools in particular IT may not be well received by developing-country employees under various cultural influences. Attitudes towards computers are thought to influence not only the acceptance of computers but also future behaviors, such as using computers as a professional tool in schools (Becker, 2000; Earle, 2002; Kumar and Kumar, 2003). The above findings provide an expanded understanding of the factors that promote EUA model.

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