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Role of Organizational Culture in Acceptance of Technology Among Teachers of Smart Schools Based on the Technology Acceptance Model: A Case Study of High Schools of Karaj City

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Abstract

Background: Acceptance of information technology by teachers of smart schools in which learning-teaching methods are based on information and communication technology is of great importance.
Objectives: The present study aimed to identify the role of organizational culture in accepting technology among teachers of smart high schools in Karaj, Iran, based on the Technology Acceptance Model (TAM).
Methods: The present study was conducted by a correlational method, which was of prediction type. Among 5,630 teachers of smart high schools in Karaj city in the 2018 - 2019 school year, 400 teachers were selected by multistage random cluster sampling method. Organizational culture was measured by Denison's organizational culture questionnaire (2000). For assessing the acceptance of technology among teachers, a researcher-made questionnaire was used. The questionnaire's construct validity was confirmed by the confirmatory factor analysis method. The reliability was confirmed by Cronbach's alpha of 0.86, 0.74, 0.88, 0.73, and 0.81 for the dimensions of perceived usefulness, perceived ease of use, attitude toward use, intention to use, and actual use, respectively. The data were analyzed by structural equation modeling in AMOS V. 24 software.
Results: All the direct and indirect coefficients between the research variables were statistically significant ($P < 0.01$). This means that organizational culture was effective on acceptance of technology among teachers of smart schools and the recommended conceptual model among teachers of smart schools was valid.
Conclusions: The process of the effect of organizational culture on the acceptance of technology and the relationship between the components of the TAM were discussed. Based on the results, all the direct and indirect coefficients between the research variables were statistically significant ($P < 0.01$), that is, organizational culture was effective on acceptance of technology among smart school teachers, and the proposed conceptual model was reliable among teachers of smart schools.

Keywords: Organizational Culture, Technology Acceptance, Smart Schools' Teachers

1. Background

In recent decades, technology has spread in all the fields of education (1) and the rapid growth of information and communication technology (ICT) has considerably transformed education (2).

A smart school is a school in which all the processes, including management, control, learning-teaching, educational and education-assistance resources, assessment, instruction and office affairs, and communications and their development, are designed based on ICT aiming at enhancing a research-based educational system (3).

The teachers of smart schools are expected, besides possessing a desirable level of knowledge in the field of ICT, to have a positive attitude toward accepting technologies (4). Technology acceptance refers to the level of the individual's tendency to use technology for realizing the intended goals (1).

Different theoretical models have been proposed for identifying the factors affecting individuals' decision-making for making use of technology, among which one can point to the Reasoned Act Theory (5), the Planned Behavior Theory (6), and the Technology Acceptance Model (TAM) (7). Among them, TAM has gained more empirical support (8). This model was first proposed by Davis (9). Based on this model (Figure 1), acceptance or rejection of any new technology relies on two key beliefs in individuals

called the perceived usefulness (PU) and the perceived ease of use (PEU). PU is the level of likelihood that, according to the individual's belief, using technology can improve job performance. PEU, which directly affects PU, refers to the degree of the individual's belief in the notion that using technology would be needless of any effort (9). These two variables jointly affect the individual's attitude toward using (ATU) technology. ATU technology indicates the individual's overall affective reaction toward making use of technology. Based on this model, ATU and PU directly affect the individual's intention to use (IU) technology while PU can also indirectly (through ATU) affect the individual's IU technology. The IU also determines if the individual is willing to make an actual use (AU) of technology or not (10).

Based on the TAM, the PU and PEU are affected by external variables and Davis (9) advises researchers to identify these variables. Accordingly, extensive studies were conducted to identify the external variables and various factors were suggested among which, system features, training, user support (4, 11, 12), personality properties, and demographic characteristics (10, 13-15) can be mentioned. Organizational culture is another external variable that can affect individuals' technology acceptance. In the present study, Denison model (16) was selected as the theoretical basis of organizational culture. In Denison's view, organizational culture refers to basic values, beliefs, and principles that are the foundations of an organizational management system, and it is also a set of management methods and behaviors that not only uses these basic principles but also reinforces them (16). As was clearly stated in the definition, organizational culture is related to values, beliefs, principles, and behaviors that inform the management system of an organization. Based on Denison's paradigm, organizational culture has four features (involvement, consistency, adaptability, and mission), each of which has three indices and these four features altogether facilitate the organization's capacity for integrating and coordinating internal resources and creating consistency with the external environment; they eventually lead to improvement of the organization's performance (16). Involvement is a state in which the staff feels that their abilities are highly related to the organization's goals, they are empowered, teamwork is valuable, and the development and growth of the staff's capabilities are a priority. This feature is measured by three indices of empowerment, team orientation, and capability development (17). Consistency refers to the ability of an organization for concentrating, controlling, and integrating the organizational processes, and it is measured by three indices of core values, agreement, coordination, and integration. Adaptability means an organization's capability for identifying and adapting with changing conditions of the organization and the organization's customers. This feature is measured by three indices of creating change, customer focus, and organizational learning. The mission feature provides a framework for orientation, goals, and strategic visions that guide the organization. This feature is measured by three indices of strategic direction and intention, goals, objectives, and vision (17).

Numerous studies across Iran and around the world have investigated the role of organizational culture in technology acceptance (18-24). Reviewing the literature showed no prior research investigating the role of organizational culture in technology acceptance among teachers of smart schools. Furthermore, although the validity of the TAM has been investigated and confirmed in developed countries, it cannot be generalized into other nations and cultures (25). For example, this model could not predict the extent of technology use in Japan (26). In addition, TAM only provides general information on the acceptance of a special technology (11); hence, collecting detailed information on its validity in special environments is necessary (27).

2. Objectives

Hereupon, the present study sought to not only identify the role of organizational culture in technology acceptance among teachers of smart high schools in Karaj city, Iran, but also examine the applicability of the TAM in the above-mentioned population. The research conceptual model is presented in Figure 2.

2.1. Hypotheses

There is a relationship between organizational culture and PEU of technology among teachers of smart schools.

There is a relationship between organizational culture and PU of technology among teachers of smart schools.

There is a relationship between PEU and PU of technology among teachers of smart schools.

There is a relationship between PU and ATU of technology among teachers of smart schools.

There is a relationship between PEU and ATU of technology among teachers of smart schools.

There is a relationship between ATU and the decision to use technology among teachers of smart schools.

There is a relationship between PU and the decision to use technology among teachers of smart schools.

There is a relationship between the decision to use and AU of technology among teachers of smart schools.

PU mediates the relationship between organizational culture and the ATU of technology among teachers of smart schools.

PEU mediates the relationship between organizational culture and the ATU of technology among teachers of smart schools.

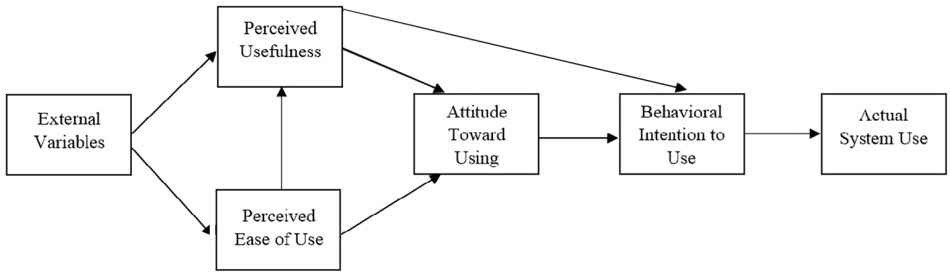

Figure 1. Technology Acceptance Model (TAM, 7)

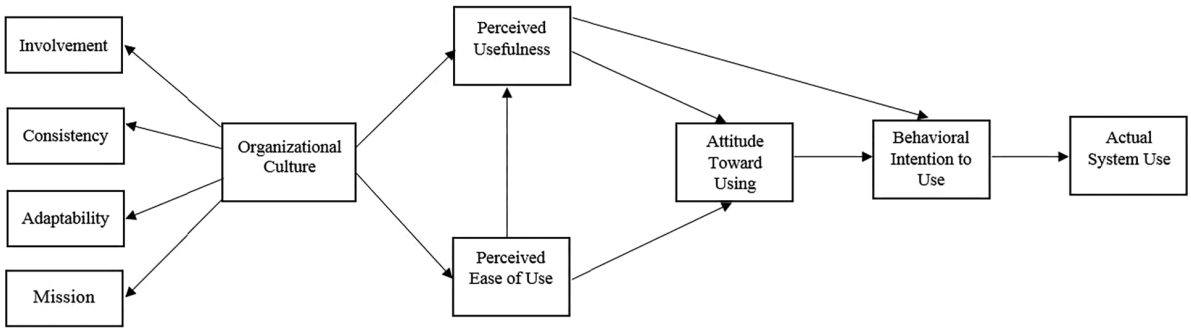

Figure 2. The research conceptual model

ATU of technology mediates the relationship between PU and decision to use technology among teachers of smart schools.

ATU of technology mediates the relationship between PEU and decision to use technology among teachers of smart schools.

3. Methods

The present study was conducted based on a cross-sectional method. The statistical population included all the teachers of smart high schools in Karaj, Iran, in the 2018 - 19 school year, which include 5,630 teachers. The Cochran formula was used to estimate the sample size, as follows:

$$\frac{1.96^2 \times \frac{0.5\times0.5}{0.5^2}}{1+\frac{1}{5630}1.96^2 \times \frac{0.5\times0.5}{0.5^2}-1} = 359.68 = 370 \quad (1)$$

According to the above formula, the required sample size for the current study was 370 individuals. However, according to the possible dropout in the questionnaires and to reduce the error, the sample size increased to 400 individuals. Using a multistage random sampling method, 60 smart high schools (15 schools per district) were randomly selected among the schools of four districts of Karaj. Then, depending on the number of teachers in each school, six or seven questionnaires were distributed to the teachers of each school and finally, the questionnaires were completed by 400 teachers in these high schools. After collecting the questionnaires and examination, 23 questionnaires were omitted from the analysis process due to being incomplete. Therefore, 377 questionnaires were analyzed. The following tools were used for gathering the data.

3.1. Technology Acceptance Questionnaire

For assessing technology acceptance among the teachers, a researcher-made questionnaire was used. For designing the questionnaire, we used the TAM developed by Davis et al. (7) besides the items of the technology acceptance scales by Teo et al. (28) and Gardner and Amoroso (29), both of which were developed based on the TAM. For this purpose, first, the items of the above-mentioned questionnaires were translated into Persian and then, some changes were made in the items for making them appropriate for the goal and statistical population of the present study (teachers of smart schools). In the next phase, the initial questionnaire was delivered to a number of experts in the ICT field and the required modifications were made

in the questionnaire. Finally, the 26-item technology acceptance questionnaire was developed in the five dimensions including perceived usefulness (6 questions), perceived ease of use (6 questions), attitude toward use (4 questions), intention to use (5 questions), and actual use (5 questions). In this questionnaire, the subjects provided their answers on a five-point Likert scale (totally agree to totally disagree). For investigating the construct validity of the questionnaire, two methods of explorative factor analysis and inferential factor analysis were used. In the explorative factor analysis, the analysis of the main components was done. Moreover, the Varimax rotation method was used for the interpretability of the extracted components.

In Figure 3, the scree plot for determining the number of extracted components was presented. According to the Figure 3, it is clear that the five components were extractable for this questionnaire.

Table 1 shows the results of the exploratory factor analysis after the Varimax rotation had been reported. According to the reported results in the Table 1, it is evident that the five factors or components were extractable for the questionnaire. According to the extracted questions for each component, it is clear that the first component was related to the first factor by questions 2, 7, 25, 12, 17, and 22, which included for the component of the perceived feeling of comfort. Other components and the relating questions are presented in Table 1.

For assessing the construct validity of the questionnaire, the confirmatory factor analysis method was used and the results related to the model's fit indices (Table 2) confirmed the presence of all five factors. Also, the Cronbach's alpha coefficients for calculating the questionnaire's reliability in a 56-individual sample were calculated for the dimensions of perceived usefulness, perceived ease of use, attitude toward use, and intention to use, which equaled 0.86, 0.74, 0.88, and 0.73 respectively, and the Cronbach's alpha coefficient for the actual use equaled 0.81, which is an acceptable reliability.

3.2. Denison's Organizational Culture Questionnaire (2000)

This questionnaire included 60 questions developed based on a five-point Likert scale (totally disagree to totally agree). Questions 1 to 15 measure involvement with work, 16 to 30 measure consistency, 31 to 45 measure adaptability, and 46 to 60 measure the mission component. The reliability of this tool was confirmed in various studies (30, 31). In research conducted by Mortazavi et al. (31), the reliability of the tool on 104 respondents equaled the following: 0.87 for involvement, 0.85 for consistency, 0.78 for adaptability, and 0.76 for mission. In the present study, the reliability of the tool was calculated by the Cronbach's alpha on 56 individuals, which equaled 0.86, 0.78, 0.81, and 0.83, respectively, for the above-mentioned dimensions, and equaled 0.82 for the whole questionnaire. The data were analyzed by the structural equation modeling method in AMOS24 software.

4. Results

In sum, 377 individuals participated in the current study (183 females and 194 males). The mean age of the participants was 43.27 years with a standard deviation of 4.31 years. Work experience was 1 - 5 years in 26.4%, 6 - 15 years in 62.14%, and over 16 years in 11.46% of the participants. Moreover, 3.18% of the participants had Associate degrees, 87.6% had Bachelor degrees, and 9.22% had Master degrees or higher.

Table 3 describes the scores of organizational culture and technology acceptance. Based on the data, the two dimensions, perceived usefulness and attitude toward using technology, had the highest (20.21) and the lowest (13.17) mean scores, respectively. Concerning the organizational culture variable, the highest mean score belonged to the consistency dimension (44.13) and the lowest mean score belonged to the involvement dimension (38.36).

As the main aim of the present study was to investigate the relationships between the variables, structural equation modeling was used to analyze the data. The maximum likelihood method was used for estimating the structural model's parameters. Figure 4 shows the assumed structural model and the estimated model parameters. The estimated parameters in the structural model are the standard coefficients.

Before interpreting the results obtained from the structural model, first, the goodness of fit of the assumed model needed to be checked. The findings related to the structural model's fit with the data are reported in Table 4.

The findings presented in Table 5 clearly suggest that all of the fit indices have acceptable values. Therefore, the results of structural equation modeling can be interpreted. Table 6 shows the results related to direct prediction coefficients.

According to the results reported in Table 3, it is observed that all of the direct coefficients between the research variables are statistically significant at the 0.01 level. For investigating the indirect role of the research variables, the Bootstrapping method was used. Table 6 presents the results of the Bootstrapping test for investigating the mediating role of the research variables.

According to the results presented in Table 6, it is clear that all of the mediating variables could play a mediating role between the predictive and criterion variables.

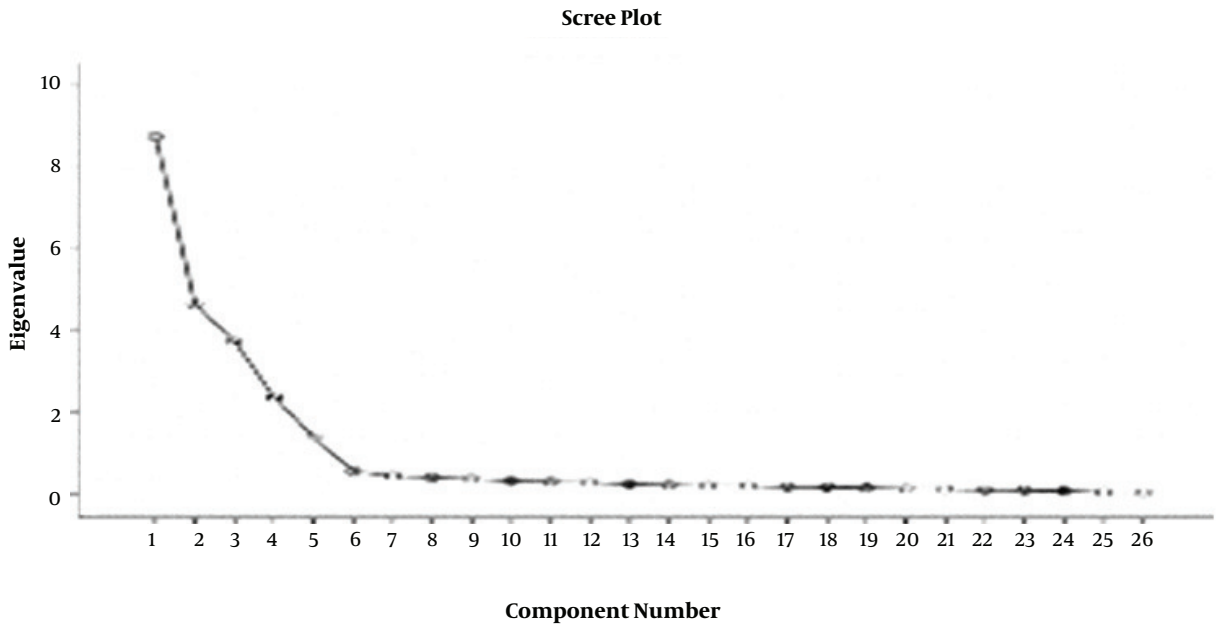

Figure 3. Scree plot for determining the number of components in the questionnaire

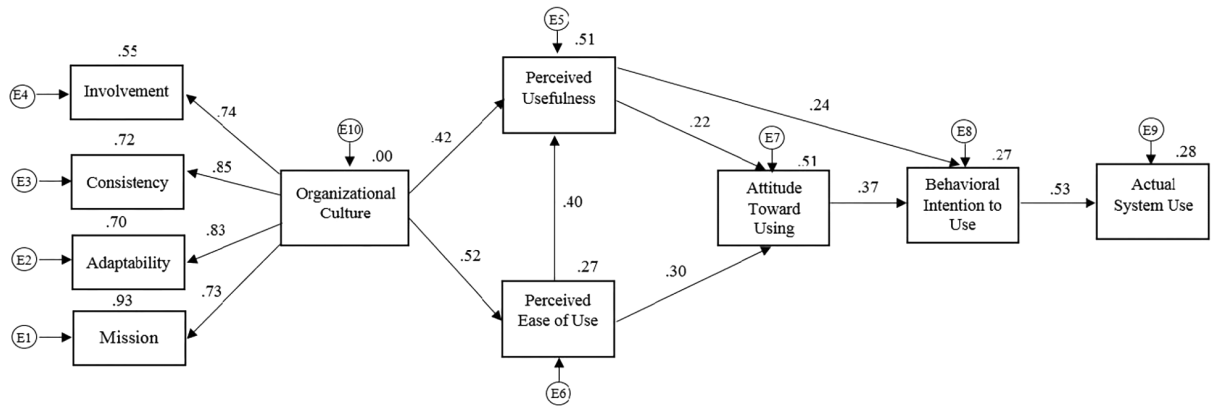

Figure 4. Estimated standard coefficients for the developed model

5. Discussion

The present study aimed to identify the role of organizational culture in the acceptance of technology among teachers of smart high schools in Karaj, Iran, based on the TAM. The current study indicated that organizational culture and all its dimensions (involvement, consistency, adaptability, and mission) had direct impacts on using technology, which is consistent with the results of prior studies (19-24). These investigations showed that organizational culture is one of the factors affecting attitude, acceptance, and/or use of technology among companies staff (19), hospital staff (20, 23), university students (21), education staff (22), and school teachers (24).

This finding is also consistent with prior studies (18, 32, 33) that suggested failure in educational innovations, including technology-enhanced innovations, results from organizational culture. The two dimensions, consistency and adaptability, had the highest role in technology acceptance by teachers. This finding means that the acceptance and use of information technology are easier and faster in schools in which innovation, risk-taking, and knowledge-attainment are encouraged, wishes and needs of students

Table 1. Exploratory Factor Analysis with Varimax Rotation for the Technology Acceptance Questionnaire

	Components				
	Perceived Ease of Use	Perceived Usefulness	Intention to Use	Actual Use	Attitude Towards Use
s2	0.952				
s7	0.859	0.346			
s25	0.852	0.321			
s12	0.828				
s17	0.805	0.332			
s22	0.786	0.371			
s6		0.846			
s1		0.827			
s21		0.804			
s16		0.802			
s26		0.782			
s11		0.727			
s4			0.921		
s24			0.906		
s19			0.900		
s14			0.880		
s9			0.874		
s5				0.909	
s15				0.897	
s10				0.836	
s23				0.785	
s20				0.768	
s3					0.908
s8					0.884
s18					0.863
s13					0.849

Table 2. The Fit Index for the Five Components of the Technology Acceptance Questionnaire with the Data

Fit Indices	Calculated Value
RMSEA	0.079
AGFI	0.92
NFI	0.91
CFI	0.90
IFI	0.95
NNFI	0.93

are prioritized for the staff, and there is flexibility in accepting necessary changes for the sake of progress and development. Besides, schools whose staff have a set of shared core values, are able to come to agreement when facing important disagreements, and have good coordination and collaboration in achieving shared goals, can perform better in accepting and using technology for the purpose of improving learning-teaching methods. The present study also suggests that perceived usefulness directly affects the teachers' intention to use technology, which is consistent with the findings of previous studies (34-37). Hence, the teachers' belief that technology can lead to increase the students' interest and learning or, overall, to increase the effectiveness of education can have an important role in teachers' intention to use technology in the teaching-learning process.

The present study, consistent with prior research (34, 38, 39), showed that positive attitude toward technology

Table 3. Descriptive Properties of the Main Variables of Research

Variables	Mean	SD	Skewness	Kurtosis
Perceived usefulness	20.21	3.45	0.11	0.43
Perceived ease of use	18.37	2.21	0.64	0.17
Attitude toward use	13.17	2.66	0.09	0.26
Intention to use	15.74	1.81	0.81	0.79
Actual use	15.07	2.17	0.29	0.08
Involvement	38.26	6.25	0.63	0.51
Consistency	44.13	8.62	0.46	0.23
Adaptability	40.81	9.01	0.37	0.44

Table 4. Fit indices of the Assumed Structural Model of Research

Fit indices	Value	Criterion	Interpretation
Absolute			
χ^2	56.42 degree of freedom 24	-	-
P value	0.01	> 0.05	No fit
Relative chi-square	2.27	< 3	Acceptable
Goodness of fit index (GFI)	0.95	> 0.90	Acceptable
Comparative			
Tucker-Lewis index (TLI)	0.93	> 0.90	Acceptable
Comparative fit index (CFI)	0.95	> 0.90	Acceptable
Parsimonious			
Root mean square error of approximation (RMSEA)	0.072	< 0.08	Acceptable
Normed fit index	0.94	> 0.90	Acceptable

Table 5. Standard and Non-standard Coefficients for Direct Prediction of the Variables of the Assumed Structural Model

		Non-Standard Coefficient	SD	Critical Value	Standard Coefficient	P
Organizational culture →	**Ease**	0.249	0.026	9.629	0.521	0.01
Organizational culture →	**Usefulness**	0.311	0.038	8.120	0.416	0.01
Ease →	**Usefulness**	0.629	0.069	9.061	0.403	0.01
Usefulness →	**Attitude**	0.172	0.045	3.850	0.233	0.01
Ease →	**Attitude**	0.363	0.070	5.213	0.302	0.01
Attitude →	**Intention**	0.254	0.033	7.704	0.373	0.01
Usefulness →	**Intention**	0.124	0.025	4.902	0.237	0.01
Organizational culture →	**Mission**	1.132	0.083	13.643	0.728	0.01
Organizational culture →	**Adaptability**	1.627	0.104	15.616	.834	0.01
Organizational culture →	**Consistency**	1.587	0.100	15.881	0.851	0.01
Organizational culture →	**Involvement**	1.0000			0.739	0.01
Intention →	**Actual use**	0.635	0.052	12.119	0.530	0.01

can lead to individuals' intention to use technology which, in turn, leads to the actual use of technology among teachers of smart schools. This finding is consistent with the results of studies conducted by Teo (1) and Luan and Teo (4). In fact, expansion and application of technologies effective on education, without considering the teachers' at-

Table 6. The Bootstrapping Test for Investigating the Mediating (Indirect) Role of the Research Variables

Effect	Coefficient	95% Confidence Interval	Significance Level
Organizational culture → usefulness → attitude	2.09	(0.89 - 4.12)	0.01
Organizational culture → ease → attitude	2.11	(0.98 - 4.80)	0.01
Usefulness → attitude → intention	1.55	(0.52 - 2.11)	0.05
Usefulness → attitude → intention	1.42	(0.72 - 3.51)	0.01

titude and understanding it, can lead teachers to resist against the arrival of innovative technologies so that using technologies might lead to no result or less-than-optimum results. Having a comprehensive understanding of the teachers' attitude is among the important factors for creating motivation and increasing academic-technical creativity among teachers. In other words, understanding the teachers' attitude toward using educational technology can lead to the enrichment of the learning environment (40). Attitude toward using technology is affected by various factors. The present study confirmed the usefulness of the TAM and suggested that teachers' attitude toward using technology is affected by two variables including perceived usefulness and perceived ease of use. In other words, based on the TAM and the findings of the current study, the formation of a positive attitude toward using technology in the learning-teaching process among teachers of smart schools requires that teachers consider technology as a useful tool for improving learning in students and can use it easily. Accordingly, to create a positive attitude toward using technology among teachers, those technologies should be selected that not only increase the effectiveness of education, but also are easily learned by teachers. On the other hand, the present study showed that all the indirect coefficients between research variables were statistically significant, that is, all the mediating variables could play a mediating role between predictive and criterion variables; this finding suggests the validity of the TAM among the teachers of smart schools.

For years, information and communication technology has gained the attention of researchers in the field of education due to its capabilities for changing the paradigm in learning, teaching, and enhancing the teachers' ability to manage and disseminate knowledge (41), making learning meaningful, and increasing the effectiveness and efficacy of teachers (42). It is believed that the progress in computer technologies has increased new teaching strategies and as a result, has led to increased learning motivation among students (1). Accordingly, it is necessary to identify the variables that can have positive impacts on applying information technology by teachers. The present study suggests that organizational culture is one of these variables. Therefore, according to the facilitating role of organizational culture in the acceptance and use of technology by teachers of smart schools, it is suggested that the authorities of the educational system and the principals of smart schools prioritize the understanding and promotion of organizational culture at the top of their programs and actions.

The population of the present study included the teachers of high schools, which implies caution in generalizing the results to preschool and primary school teachers. Furthermore, the methodology of the present study was of correlational type, which makes it difficult to have a causal conclusion about the findings. Hence, this issue must be considered in interpreting and generalizing the findings of the present study.

Footnotes

Authors' Contribution: Sayed Abdollah Ghasemtabar devised the study concept, designed the study, supervised the intervention, and drafted the manuscript, and critically revised the manuscript for important intellectual content. Gholam Hosein Rahimidoost participated in administrative, technical, and material support and study supervision. Mehdi Arabzadeh contributed to statistical analysis and interpretation of data.

Conflict of Interests: The authors declare that they have no conflicts of interest.

Ethical Approval: The study was conducted under the supervision and approval of the Research Deputy of Psychology and Educational Science, Kharazmi University.

Funding/Support: This study was funded by the authors.

Patient Consent: At the beginning of the study after the researchers had introduced themselves, they explained the objectives of the study and all data were obtained with the consent of participants.

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