Investigating the Application of Technology Acceptance Model in Smart Schools

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ABSTRACT

Background: The rapid growth of information and communication technology has brought about substantial changes in educational practices and approaches. Education and training have received more attention in view of technological developments and emerging requirements. The aim of this study was to investigate school principals' application of Technology Acceptance Model (TAM) in smart schools of Qom, Iran.

Methods: This was a descriptive-correlational study. The study population included all smart school principals in Qom in 2018. Purposeful sampling was applied to identify and select 70 principals as the participants of the study. Davis' TAM questionnaire with a reliability coefficient of 0.78 was used for data collection. Descriptive statistics, including mean and standard deviation, were calculated for data analysis, and Pearson correlation coefficient was used in the inferential analysis.

Results: Significant positive relationships were observed between perceived usefulness and attitude towards the use of technology (r=73, P<0.01), perceived usefulness and willingness to use technology (r=64, P<0.01), perceived ease of use and attitudes towards the use of technology (r=39, P<0.01), perceived ease of use and perceived usefulness of technology (r=43, P<0.01), and finally the tendency to use and actual use of technology (r=63, P<0.01).

Conclusion: In order to improve the performance of smart schools, it is recommended to cultivate a positive and constructive attitude towards technology among principals and teachers in a dynamic way.

Keywords: Technology Acceptance, TAM model, Smart Schools

Introduction

In the present age of information and communication, the most important factor and indicator of progress is scientific and educational development. Therefore, students need to have a better command of technical, information and communication skills (1). The rapid growth of information and communication technology has transformed the technical processes in education, as well as teaching methods and the roles of teachers and students (2, 3). In an information society, education has a mission to integrate technological facilities and tools in school curricula to educate citizens in accordance with the needs and requirements of that society. One specific method of incorporating information technology into curriculums is to set up "smart schools", which can be considered one of the most evident uses of information technology in education (4). This method was first used in 1984 under the supervision of universities, but the term has become popular in a number of countries such as Taiwan and especially Malaysia (5). There is always resistance among people to accept new technologies. The reasons could be the uncertainties surrounding a new system and the difficulties in learning how to use that system. Various tools have been proposed to measure the technology acceptance behavior, including Fishbein and Ajzen's theory of reasoned action (1980), Rogers' Innovation-Diffusion Model (1995), and Davis' Technology Acceptance Model (TAM). According to the surveys of information technology models, the Davis' model is the most authoritative model because it examines individual-level factors and has been approved in many studies. This model is adapted from the Theory of Reasoned Action of Fishbein & Ajzen, and was first proposed by Davis in 1986 (6). TAM is a trend-based model and states that the desire to adopt a technology is a good predictor for the actual use of that technology, and user behavior can be predicted before using the technology. According to this model, ICT adoption is influenced in a four-step process: 1- External variables influence users' opinions on the use of information and communication technology. 2. Users' opinions affect their attitude towards the use of information and communication technology. 3. Users' attitudes affect their desire to use information and communication technology. 4. The decision of users to use information technology determines the level of their use (7).

Many studies have been conducted on smart schools and technology acceptance. For instance, Seraji (8) elaborates on the obstacles to the development of smart schools. According to him, teachers' and principals' resistance to use technology-based approaches are due to the lack of positive developments regarding the effectiveness of e-learning and the lack of ICT knowledge in the educational community. In separate studies, Lee and Wu (9, 10) examined the barriers to the use of information technology. At the end of these studies, they placed the barriers in four categories, namely human, social, economic and technical factors. Among human barriers, the factors such as lack of motivation, lack of knowledge about technology and fear of the future were the most important barriers to technology adoption (9, 10). Mohammadi et al. (11) They also identified the lack of physical context and supportive policies appropriate to smart schools in Tehran as one of the most important problems of these schools. In this study, they regarded the five main advantages of using new technology to be usefulness, easy access to content, core learning knowledge, multimedia interaction, and the possibility of distance learning. In their research, Kilink et al. (12) examined Turkish teachers' views on the use of educational technologies. The descriptive results of this study indicated that participants had a positive view of the usefulness of technology in schools. In addition, there was a positive relationship between individuals' attitudes towards technology and their knowledge of technology. Salleh (13) investigated teachers' beliefs regarding the use of technology in schools. Her findings show that there is a relationship

between the intention to use information technology in schools, the attitude towards the use of technology and its application. In a study, Jeon (14) examined the feasibility of using smart classrooms in Korean schools and the important factors influencing this initiative. The results of this study showed that students and teachers agree with the need to set up smart classrooms and acknowledge the need to have diverse teaching methods in classroom environments. Furthermore, motivation, correct knowledge of technology, skilled technical workforce and proper facilities were identified as effective factors in developing smart schools. In another study, Voogt (15) tested the teachers' readiness to use information technology. The results show that the use of computer and software among teachers is at a moderate level, and encouraging them to use technology requires the provision of facilities and identification of strengths and weaknesses. The results of Durrani & Rashidi's (16) research showed that individual perceptions towards the easy usage of information technology has a significant effect on their mental perceptions of the usefulness of information technology and their attitudes towards information technology. Also, the variable of mental perception about the usefulness of information technology has a significant effect on the decision to use information technology and this variable has a significant effect on the use of information technology.

Given the potential benefits of technology in education, such as rising productivity, promoting media literacy, facilitating the learning process, and increasing the quality of education, these technologies must first be accepted by authorities. Accepting information technology and making good use of it can help principals fulfill their responsibilities in the best possible way and strengthen their general skills such as problem solving, critical thinking, communication skills and creativity. A review of literature shows that so far there has been no coherent study about technology acceptance in smart schools, especially among school principals

as the people in charge of these schools. Therefore, in view of the need to prevent additional and unnecessary costs, increase the efficiency and effectiveness of education, train entrepreneurial students and adapt to current needs, it is critical to evaluate ICT acceptance among smart school principals. Therefore, the purpose of this study is to investigate principals' application of technology acceptance model (TAM) in smart schools.

Methods

This was a descriptive-correlational study performed to determine and measure the implementation of Davis' Technology Acceptance Model. The statistical population included 70 principals of smart schools in Qom province, Iran. Purposeful sampling was applied to select the study participants. The criteria for entering the research included at least one year's experience of working in smart schools, familiarity with computers, automation and software used, and participants' willingness to participate. Those respondents who returned incomplete questionnaires were excluded from the study. The researchers also assured the participants that their information would remain confidential. The research questionnaire determined the correlation between external variables and other variables such as perception of ease of use, perception of usefulness, attitude and willing behavior about technology acceptance among school principals, through a self-report questionnaire that consists of seven parts and was based on Davis questionnaire. (17). Davis' TAM questionnaire was developed in 1986 and comprises 25 questions, with a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). The questionnaire comprises questions about demographic characteristics, perceived ease of use of information technology (the degree to which one believes that the use of the technology is easy and simple), perceived usefulness of information technology (the degree to which one believes that the use of the technology improves

individual performance), the attitude towards the use of information technology (the user's assessment of the desirability of using technology), the attitude towards the output quality of information technology, expected enjoyment in using information technology and the desire to use information technology.

The credit rating index indicates the percentage of agreement between experts over each and every brand. To determine the validity of the questionnaire, the researchers consulted the opinions of the individuals who participated in the process of determining the validity of the content, as well as the opinions of 10 qualified faculty members with specialized doctorate degrees in the field of educational management. In this study, the internal consistency of the research instrument was assessed to determine the reliability of the instrument. In order to verify the internal consistency, the questionnaire was handed to 15 eligible employees (a). The expected enjoyment of information technology and the tendency to use information technology were measured at (0.66) and (0.78) respectively, indicating the optimal internal consistency of this questionnaire. For data analysis, indicators such as mean and standard deviation were used in the descriptive statistics section, and Spearman correlation coefficient was employed in the inferential section.

Results

The study involved 70 school principals in Qom, of whom 45 were male and 25 were female. In terms of age, the highest number of respondents were in the 20-30 age group, and the lowest age group was 41-50 years. Also, in terms of work experience, people with 10 to 20 years of experience made up 50% of the study sample.

In this study, Davis' scale with 9 components or subscales were used. The descriptive statistical data of the subscales are shown in Table 1.

Testing Hypotheses

The first hypothesis in this study is that there is a significant relationship between school principals' perceived usefulness of technology and their attitude towards the use of technology in smart schools (Table 2).

As indicated in Table 2, there is a positive and significant relationship between usefulness and attitude towards the use of technology in smart schools (r=0.73, P<0.01).

The second hypothesis assumes that there is a significant relationship between school principals' perceived usefulness of technology in smart schools and their willingness to use technology (Table 3).

According to Table 3, there is a positive and significant relationship between usefulness of technology and willingness to use it in smart schools (r=0.64, P<0.01).

The third hypothesis holds that there is a significant relationship between school principals' perceived ease of use and their attitudes towards the use of technology in smart schools (Table 4).

Table 4 shows that there is a positive and significant relationship between the principals' perceived ease of use and their

Table 1: Descriptive Findings of Research Sub-Scale

Statistical Index	Mean	Average standard error	Standard deviation
Scale			
Individual Factors	20.45	0.49	4.12
Social Factors	11.73	0.28	2.38
Organizational factors	7.45	0.22	1.89
Technology Features	21.46	0.43	3.6
Usefulness of application	15.80	0.30	2.51
Ease of use	16.14	0.30	2.56
Attitude	16.72	0.26	2.24
Tendency to use technology	16.99	0.31	2.64
Use of technology	8.19	0.16	1.40

Table 2: Correlation coefficient of the research variables (Usefulness – Attitude)

Variables	Correlation coefficient	Significance level
Usefulness – Attitude	**0.73	0.000

**P<0.01

Table 3: Correlation coefficient of the research variables (Usefulness - Willingness to use)

Variables	Correlation coefficient	Significance level
Usefulness - Willingness to use	** 0.64	0.000

**P<0.01

Table 4: Correlation coefficient of the research variables (Ease of Use – Attitude)

Variables	Correlation coefficient	Significance level
Ease of Use – Attitude	** 0.39	0.000

**P<0.01

Table 5: Correlation coefficient of the research variables (Ease of Use-Usefulness & Tendency to Use-Use)

Variables	Correlation coefficient	Significance level
Ease of Use – Usefulness	** 0.43	0.000
Tendency to Use – Use	** 0.63	0.000

**P<0.01

attitudes towards the use of technology in smart schools (r=0.39, P<0.01).

The fourth hypothesis posits that there is a significant relationship between the principals' perceived ease of use and perceived usefulness of technology in smart schools. Also there is a significant relationship between the principals' tendency to use technology and the actual use of technology in smart schools (Table 5).

Based on Table 5, there is a positive and significant relationship between the school principals' perceived ease of use and perceived usefulness of technology in smart schools (r=0.43, P<0.01). Also there is a positive and significant correlation between the tendency to use technology and the actual use of technology in smart schools (r=0.63, P<0.01).

Discussion

The purpose of this study was to investigate the applicability of the information technology acceptance model. A correlation coefficient was used to analyze the data. The results showed that there is a positive and significant relationship between perceived usefulness and the attitude towards the use of technology. There is also a positive and significant relationship between perceived usefulness and willingness to use technology. In addition, there is a positive and significant relationship between ease of use and attitude toward the use of technology. There is also a positive and significant relationship between ease of use and school principals' perceived usefulness of technology. A positive and significant correlation was also found between the willingness to use technology and the actual use of technology in smart schools. In total, five hypotheses were proposed in accordance with Davis' technology acceptance model. An explanation of the hypotheses in the light of the research findings is provided in the following paragraphs.

The findings showed that there is a positive and significant relationship between school principals' perceived usefulness of technology in smart schools and their attitude towards using this technology. As mentioned earlier, the perceived usefulness of information technology or the degree to which an individual has confidence in the using technology systems improves their personal

performance. This is confirmed by the result of the first hypothesis and suggests that school principals have a positive perception of technology in education. They believe that the use of technology is effective in improving their performance, and this belief has led to their positive attitude towards technology usage. Similar studies have highlighted the positive effect of technology on people's attitude towards using it in schools, including Seraji et al. (8), Lee et al. (9), Wu et al. (10), Mohammadi et al. (11), Kilink et al. (12) and Jeon (14). These studies indicate that if school principals or teachers have a positive perception of the usefulness of information technology in schools and improve their performance, it will lead to a positive attitude towards this technology among the principals. Implementing any new plans and developing them necessitate having a positive and accepting attitude in the first place.

As mentioned before, the findings showed that there is a positive and significant relationship between school principals' perceived usefulness of technology in smart schools and their willingness to use this technology. As discussed earlier, being useful reflects a person's belief in the usefulness of technology in improving performance, and given the results of the second hypothesis, it can be argued that one of the effects of this belief, along with positive attitude towards using smart schools, is the principals' willingness to use technology. This result is consistent with those of Seraji et al. (8), Lee et al. (9) Wu et al. (10), Mohammadi et al. (11), Kilink et al. (12) and Jeon (14). In a similar study on teachers in Tehran's smart schools, Durrani and Rashidi (16) found that the perceived usefulness of IT did also have a significant effect on the willingness to set up smart schools. Encouraging a positive attitude towards smart schools and promoting the belief that they have a significant impact on principals' performance are an important basic element in the implementation of smart school programs. Furthermore, some studies have confirmed this finding in other institutions, and indicated that a positive

perception of usefulness will practically lead to a welcoming attitude and high satisfaction among principals and teachers.

The findings also showed that there is a significant relationship between school principals' perceived ease of use of technology in smart schools and their attitude towards using this technology. This hypothesis was also confirmed by the findings, and there was a positive and significant relationship between principals' knowledge and their attitude towards using technology in smart schools. In applying information technology, the perceived ease of use is the degree to which individuals find it easy to deploy IT systems. When using new systems, one of the factors that may result in confusion and failure is the fear of difficult and complex procedures. Considering the results of the third hypothesis, there was a strong relationship between the perceived ease of use and attitude towards the use of technology in smart schools. Previous studies on school teachers and other officials do also point to the significance of this relationship and emphasize the importance of instilling ease of use before implementing a technology. For instance, Seraji et al. (8), Mohammadi et al. (11), and Kilink et al. (12) have all underscored this point. In this regard, the study of Kilink et al. (12) shows that if teachers have a high-level understanding of IT and do not think that the use of information technology is one way and difficult, their attitude toward using this technology will be positive.

The findings showed that there was a positive and significant relationship between the principals' perceived ease of use and perceived usefulness of technology in smart schools. In this study, the perceived ease of use of technology has been presented both as an independent and dependent variable. In the first and second hypotheses, it was considered as an independent variable in relation to the other two variables, namely "attitude towards use" and "willingness to use". However, it was measured as a dependent variable in the fourth hypothesis. As indicated earlier, misperceptions about the ease of use of

a technology will be a major obstacle to applying that technology. According to the result of the hypothesis, it can be argued that an easy-going attitude towards the use of technology in smart schools will lead to a positive view about the usefulness of technology in smart school design. In short, cultivating a positive view of information technology and its educational applications among teachers and school principals is the first critical step towards the effective use of that technology. This finding is aligned with studies by Seraji et al. (8), Lee et al. (9), Wu et al. (10), Mohammadi et al. (11), Kilinc et al. (12) and Jeon (14). In line with this hypothesis, the studies by Wu et al. (10) and Kilinc et al. (12) demonstrate that positive opinions about ease of use, safety and low risk in using IT can contribute to the perceived usefulness of this technology, and obviously any technology that is easy to use can also prove more useful.

Finally, the findings showed that there is a significant relationship between the tendency among school principals to use technology and the actual use of technology in smart schools. The research findings also revealed that there is positive and significant relationship between the tendency to use technology and actual use of technology in smart schools. The attitude towards the use of technology meant the degree to which a person has a favorable evaluation of the use of technology. Previous hypotheses have shown that there is a positive and significant relationship between perceived usefulness, attitude and willingness to use technology. Regarding the fifth hypothesis, the obtained data showed that the tendency or decision to use technology (in smart schools) is positively related to the use of technology and its optimal evaluation. This hypothesis was also tested by Durrani and Rashidi (16) who examined technology acceptance among teachers of smart schools in Tehran. This result is also consistent with other research by Seraji et al. (8), Lee et al. (9) Wu et al. (10), Mohammadi et al. (11), Kilink et al. (12) and Jeon (14).

Based on the results, in order to encourage ICT acceptance and implementation among the smart school principals, education officials should develop the necessary guidelines and create a positive attitude towards this technology. Also, establishing the proper culture and raising the principals' awareness of ICT capabilities could further highlight its usefulness and lay the groundwork for the better use of this technology. In the end, it should be emphasized that, like other in-service courses, holding in-service courses on e-classes and ICT application will have a beneficial effect on principals' and teachers' perceptions and acceptance of technology.

Ethical Considerations: This study was approved by the Ethics Committee of University of Tehran. It was conducted with the consent of the participants. Also all participants were fully aware of the nature and confidentiality of the research and were assured that their information would remain confidential.

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Conflict of interests

The author declares that they have no conflict of interests.

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