

**“Use of the Technology Acceptance Model (TAM) in a Saudi Context:
A Literature Review”**

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Abstract

The Technology Acceptance Model (TAM) is one of the most well-known models in the fields of technology adaptation and information systems, having been used by numerous studies worldwide to explore technology acceptance levels across multiple sectors. TAM examines five areas: perceived usefulness (PU), perceived ease of use (PEU), attitude, intention, and usage. These five factors allow researchers to predict how readily a technology will be adopted and accepted in multiple contexts. Many international studies have used TAM as a framework for understanding how to speed up the adoption of technology among special education teachers and their students with disabilities; however, there have been few such studies in the field of special education field in Saudi Arabia. This study aims to demonstrate the importance of adapting TAM for use in special education: first, by examining TAM's background, definition, and function, as well as factors such as people's attitudes toward it and the advantages of using TAM; and secondly, by providing examples of recent studies that applied TAM as a framework in a Saudi context. Based on the findings of our study, we recommend future research opportunities.

Keywords: Technology Acceptance Model (TAM), special education, assistive technology (AT)

Introduction

Technology is a tool for improving education, and with technological support, teaching and learning become easier and more effective. Today, technology plays an important role in school classrooms: devices such as computers distribute information and help students gain knowledge and skills, as well as find cultural and experiential learning opportunities. The advent of technology has also provided new opportunities for teaching students with special needs (Stendal, 2012), playing a key role in improving these students' skills and shaping the access to knowledge for those with disabilities (Adam & Tatnall, 2008). For example, technology serves as a type of cognitive prosthesis, creating a more level playing field between students with and without disabilities by improving their development competencies (Florian & Hegarty, 2004; Martí & Mon, 2018).

As technology becomes increasingly necessary in special education, it is vital that we work to understand the factors that affect how users intend to use a system *before* developing that system. This is the key to creating a system that users adopt widely and that is readily accepted by future users (Imtiaz & Maarop, 2014; Teo, Fan, & Du, 2015). Many studies have investigated the most common factors related to use of technology, for example: demographic

information (Al Sulaimani, 2010; Menon, 2015; Mirzajani, Mahmud, Ayub, & Wong, 2015; Oyaïd, 2009; Razzak, 2014; Swarts & Wachira, 2010); type of school, type of area, or social status (Mirzajani et al., 2015; Mirzajani, Mahmud, Fauzi Mohd Ayub, & Wong, 2016); issues related to professional development or training (Cavas, Cavas, Karaoglan, & Kisla, 2009; Kahveci, Sahin, & Sebnem, 2011; Lau & Sim, 2008; Luan & Teo, 2009; Nair et al., 2012); and availability of technology, collaboration among teachers, or how teaching approaches influence classroom technology use (Gil-Flores, Rodríguez-Santero, & Torres-Gordillo, 2017). A review of the technology acceptance studies may explain the use of technology among teachers and students in school and classroom environments, with the goal of increasing technological adoption and making it more effective.

In addition to these factors, however, we must take personal factors into account. Personal beliefs, intentions, and attitudes are just as relevant to users' acceptance of technology. A study by Govender (2012) emphasized this fact, finding that the primary reason that technology was not being used in South African schools was lack of user acceptance—i.e. a negative attitude toward the technology rather than technical difficulty. More recently, when Gil-Flores et al. (2017) examined a number of factors in relation to ICT use in secondary education classrooms, including availability of education software, they concluded that teacher-related variables must be more significantly included in any future studies related to technology use in education. Investigating users' attitudes toward technology is essential if we want to design, develop, integrate, and implement said technology with minimal problems, and more studies related to users' technology acceptance are needed in the field of special education (Chen, 2011; Legris, Ingham & Collette, 2003; Yeni & Gecu-Parmaksiz, 2016).

Significance of the Study

This study is significant because it expands and adapts TAM for application in the field of special education in Saudi Arabia and, in doing so, creates additional theoretical approaches to this topic. One of the most well-known models in the technology acceptance field, TAM is an information systems model which explains how users come to accept and use a technology. TAM is a powerful model that can be used to predict technology usage in multiple fields. This study may also help to narrow an empirical gap related to the acceptance and use of technology in Saudi contexts, becoming a reference point for researchers who are interested in adapting TAM in general or for those specifically interested in the use of technology in special education. Finally, this study has the potential to inform how technology is used in special education—an area of crucial significance, given the increasingly important role technology plays in both teaching and learning.

Methodology

This study used the following electronic search engines and academic databases: EBSCO Megafire Ultimate, ProQuest databases, Informit database collection, and the Saudi Digital Library. For this literature review, the search parameters covered the Saudi context only, and pulled from articles, dissertations, master's and Ph.D. theses that had applied TAM as a theoretical framework. The search process used the following keywords: (use of technology OR Saudi Arabia) AND (Saudi Arabia OR education OR special education OR disability OR schools OR classrooms OR teachers). (Beliefs OR perceived usefulness PU OR perceived ease of use PEU) AND (use of technology OR use of technology OR technology acceptance model OR TAM) AND (schools OR education OR special education OR Saudi Arabia). (Factors) AND (use of technology OR use of technology) AND (Saudi Arabia OR education OR technology acceptance model OR TAM).

Literature Review

Theoretical Background of TAM

Since the 1970s, and with the ongoing evolution of technology, there have been a considerable number of information systems studies. Researchers often concentrated on identifying the factors that enabled technology to be integrated into businesses (Legris, Ingham, & Collette, 2003), as well as on developing models to predict the use of the technology in a wide range of contexts. TAM is a type of information systems model that seeks to understand how users come to accept and use a new technology (Davis, 1989) and that is derived from the Theory of Reasoned Action (TRA).

TRA was developed and expanded upon in the early 1970s (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) as a theory that revealed an explicable relationship between attitudes and behavior (see figure 1). TRA defines an attitude as “a psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour” (Eagly & Chaiken, 1993, p. 15). Attitudes are an independent expression that are “not merely related to beliefs, they are actually a function of beliefs” (Ajzen, 1989, p. 247). TRA considers individuals' behaviors to be rational responses based on a systematic use of current information. That is, a person's intention is related to a person's attitude toward the behavior, and this determines the performance of a particular behavior (for example, use of technology). The only factors that impact this intention are “attitudes and subjective norms” (Dillon & Morris, 1996, p. 6).

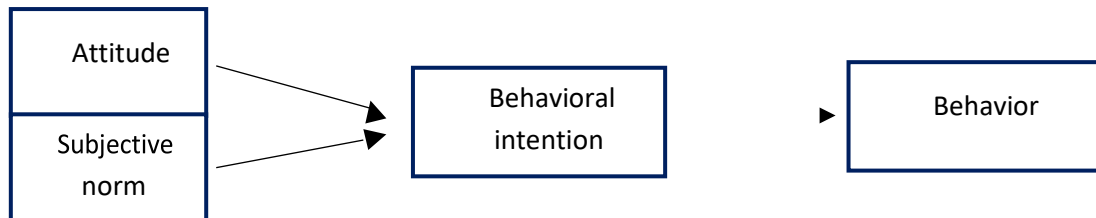


Figure 1. The original Theory of Reasoned Action (Ajzen & Fishbein, 1980)

Although TRA refers to individuals' beliefs, which determine their attitudes toward any behavior, it considered attitudes to be silent beliefs. This is because TRA is a general model and, as such, it does not define beliefs as an effective element. It also refers to a subjective norm, which is a "person's perception that most people who are important to him think he should or should not perform the behaviour in question" (Fishbein & Ajzen, 1975, p. 302).

Technology Acceptance Model (TAM)

TAM was first conceived of by Fred F.D. Davis in 1985 as part of his dissertation at the Massachusetts Institute of Technology's Sloan School of Management (Davis, 1985). This model has continued to evolve, and TAM has made Davis one of the most well-known researchers in the area of technology adoption (Legris et al., 2003). TAM is an information systems model that seeks to understand how users come to accept and use a technology (Davis, 1989). TAM differs from TRA in two crucial ways: first, TAM includes two belief variables—PU, or the degree to which a person believes that using a particular technology will improve his or her job performance; and PEU, which refers to the degree to which a person believes that using a particular technology will be effortless (see Figure 2). Both beliefs are assumed to be fundamental determinants of user acceptance. Second, TAM does not include a subjective norm as a determinate of user acceptance (Davis, 1989).

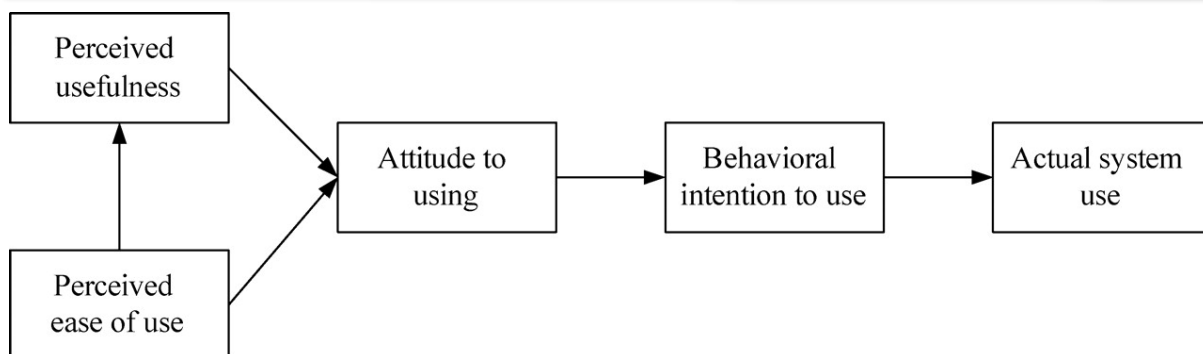


Figure 2. TAM, as proposed by Davis (1989)

Figure 2 shows that the intention to use technology is impacted by a user's attitude toward technology use, as well as the direct and indirect effects of PU and PEU. According to TAM, intention to use is jointly determined by attitude and PU, while both PU and PEU affect the attitude to the actual use of technology. PEU also has a significant, direct influence on PU, but not vice versa—something hypothesized by Davis et al. (1989). This is because PU is concerned with the overall impact of system use on job performance (process and outcome), whereas PEU pertains only to those performance impacts related to the actual process of using the system (Davis, 1993, p. 477). However, according to TAM, attitude is jointly determined by PU and PEU (Davis et al., 1989).

Although there are now a large number of studies that have adapted TAM (Chen, Shing-Han, & Chien-Yi, 2011; Govender, 2012; MacCallum & Jeffrey, 2014; Turner et al., 2010), the earliest studies were in the fields of business and marketing (Davis, 1989). These studies sought to explain and describe individuals' use and acceptance of technology in general or devices specific to certain environments. These early frameworks combined different mediating elements in an attempt to better understand which components had more explanatory power—in another words, TAM explains the relationship between internal psychological variables such as beliefs, attitudes, and behavioral intention, and actual system usage (Davis, 1985, 1989).

Since the start of the 21st century, researchers have begun to adapt this model to different environments, including schools (Chuttur, 2009; Kripanont, 2007; Nair et al., 2012; Sabraz Nawaz et al., 2015); these adaptations are relevant to a variety of teaching environments, including special education (Courduff, Szapkiw, & Wendt, 2016; Nam et al., 2013; Yeni & Gecu-Parmaksiz, 2016). In addition, education researchers have extended TAM to examine issues of technology acceptance and use among students and teachers (Teo, 2011, 2012; Teo & Wong, 2013).

TAM has also been used to explain user behavior across a broad range of end-user computing technologies and user populations. As a result, it has been empirically confirmed as a process that is successful in trends in up to 40% of technology use cases (Hu, Chau, Sheng, & Tam, 1999; Rice, 2012).

TAM is also frequently cited in the literature on technology acceptance and adoption (Lai, 2017; Legris et al., 2003); as far back as 2002, the Institute for Scientific Information's Social Science Citation Index listed 517 journal citations for the two journal articles by Davis (1989) and Davis et al. (1989) that introduced TAM (Gentry & Calantone, 2002). TAM has also been used to investigate a wide range of technologies (e.g., word processing, email, hospital information systems) and incorporated many different predictive factors (gender, organizational type, etc.) (Lee, Kozar, & Larsen, 2003). The scales of PU and PEU were also used to measure the various components of TAM, which have shown strong validity and reliability (Attis, 2014; Moses et al., 2013).

Many scholars in the fields of information systems and technology, and technology acceptance, have assessed the utility and effectiveness of TAM for predicting and explaining individuals' technology use behaviors (Aldhaban, 2016). Mathieson (1991) and Taylor and Todd (1995), for example, found after many tests that TAM could provide a complete explanation of intention and attitude toward use of technology. Their research also showed that TAM was easier to apply and was a perfect and useful predictor of technology usage. In examining TAM's utility, ChanLin et al. (2006) found that fit well with the data available and concluded that it is the most effective generic model for studying both initial and continued assistive technology adoption. Researchers have also compared TAM and TRA in general and specifically in relation to actual use of technology. Davis et al. (1989) and Mathieson (1991) found that TAM predicted software usage intention and actual usage better than TRA and other alternative models (such as the Theory of Planned Behavior). Similarly, Igbaria, Zinatelli, Cragg, and Cavaye (1997) found that TAM was much simpler, easier to use, and a more powerful model than TRA when examining the determinants of user acceptance for computer technology.

In conclusion, TAM is a commonly used model that is proven to be a "robust, powerful, and effective model for predicting user acceptance" (Venkatesh & Morris, 2000, p. 187). Further, TAM is frequently used in studies that focus on the acceptance of technology among different users (Attis, 2014; Lee et al., 2003). It has been classified as the most effective model for determining information technology acceptance and has been used in empirical studies and across technological contexts around the world (Attis, 2014).

Saudi Studies Using TAM

There are a number of educational studies in Saudi Arabia that have adapted TAM as a means to explore technology acceptance among students, schoolteachers and lecturers, at a number of universities. The basic objective of these studies is to understand the factors affecting use of technology among study participants; to this end, some have extended or combined TAM with other models and theories. However, a review of the Saudi literature revealed that there are only a few studies that focus on Saudi special education teachers and their students with disabilities. The following section describes studies that have used TAM to examine the fields of special education, general education, and higher education.

Special Education Studies

Husainan, Al-Shehri & Al-Razgan (2017) used TAM to conduct an empirical study of the factors influencing people with Deaf and Hard of Hearing (DHH) and their motivations and perceptions towards the adoption of YouTube. The results showed that DHH individuals identified some useful functions in YouTube, such as English captions and Arabic translation, however, they are not sufficiently motivated to watch YouTube videos because YouTube is a fast-paced platform and DHH people prefer to allow more time for reading and understanding content. They therefore tend to avoid sharing YouTube videos within their communities.

Ahmed (2015) investigated the impact of selected factors on the attitudes of special education teachers toward using assistive technology (AT) with students who have learning disabilities. The study used a descriptive methodology and 33 randomly selected special education teachers. The researcher used TAM as a guide for developing a questionnaire. The study's findings revealed that special education teachers had a positive attitude toward using AT technology in resource rooms for children with learning disabilities. Age and grade point average also influenced teachers' attitudes toward using AT, however, factors such as gender, parents' level of education and income, or the presence of a computer in the household or the class, were not shown to have any significant effect on teachers' attitudes.

More recently, Alghayth and Mohammed (2019) explored teachers' perspectives on the use and effectiveness of AT, taking into account the barriers and resources needed for effective use of AT with students with severe intellectual and developmental disabilities. A sequential, explanatory, mixed method design was used, applying a self-administered online questionnaire to collect data from 92 special education teachers from four special education institutes. In the

second phase, five teachers were interviewed as a means of providing additional interpretation and context for the data gathered in phase one. Three theories and models were adapted as a theoretical framework, the diffusion of innovations, TAM and the student, environment, task, and tools model (SETT). The TAM framework was adapted specifically to allow for the measurement of barriers that impact teachers' opinions on the actual use of AT. The results showed that there was low use of AT, due to multiple barriers. These included lack of AT devices, lack of funding, and lack of training. The results also demonstrated that there were statistical differences in use of AT based on differences between the four special education institutes, between teachers with and without AT training, and dependent on teachers' familiarity with AT. Data from the interviews in this study demonstrated the need for training on the use of AT, for increasing financial support, and for overcoming existing barriers that impeded teachers' use of AT.

General and Higher Education Studies

Al-Furaydi (2013) explored the use of technology in intermediate public schools. A total of 71 participants were selected using a stratified random sample from public schools in Al-Madinah, Saudi Arabia. Quantitative analysis showed that levels of computer literacy positively influenced attitudes toward technology use among teachers of English as a foreign language (EFL) in public schools. EFL teachers stated that administrators did not fully support the use of technology in their schools, indicating an administrative gap between the Ministry of Education's recommendations and school administrations. This issue arises in part due to unclear policies related to technology use in the Saudi education system. This lack of clarity has impacted how school administrations support technology use. The researcher claims that EFL teachers face two significant barriers to using technology in their teaching: lack of software reliability and lack of time. Shammari (2017) examined the applicability of an extended version TAM which includes three exogenous enjoyment (i.e perceived enjoyment, performance expectancy and facilitating condition), and tested the influence of these variables on primary school science teachers' intentions to use instructional technologies and their actual use of the technologies. From a stratified random sample, 430 science teachers were selected. The results of a structural equation modeling (SEM) analysis confirmed the influence of the original TAM constructs PU and PEU on science teachers' intention to use and actual use of instructional technologies. The results also demonstrated that the extended version of TAM was successful in explaining teachers' intentions and actual behaviors, while the results themselves are useful for training purposes for Saudi schoolteachers and for the stakeholders working on integrating these technologies into Medina primary schools.

Sabti & Chaichan (2014) also adapted TAM to investigate the attitudes of Saudi high school students toward the use of computers for learning English. A quantitative method was used to discuss the possible obstacles that limited students' actual use of computers. The study involved 30 Saudi students at a high school in Kuala Lumpur, Malaysia. According to the findings, participants revealed a strong, positive perception of both PU and PEU in relation to using computers in English classes. The study also showed three barriers that limited the use of computers: skill, equipment, and motivation. Among these barriers, skill had the highest influence, while motivation had the least.

In the area of higher education, Saudi studies have also used and extended TAM to study the use of technology among lecturers. Aljuaid, Alzahrani and Islam (2014) explored lecturers' readiness for mobile learning in higher education in terms of PU and PEU. A total of 140 lecturers from the faculty of education took an online questionnaire. The findings showed that PU and PEU are valid predictors for assessing lecturers' readiness for mobile learning in higher education, indicating that the original TAM constructs have a significant impact on mobile learning, too. Similarly, Alharbi and Drew (2014) used TAM to understand academics' behavioral intention to use learning management systems (LMS) at Shaqra University in Riyadh, Saudi Arabia. A total of 59 faculty members from different colleges and departments participated in an online questionnaire, based on an extended TAM framework which included the following additional factors: lack of LMS availability; prior LMS usage experience; and job relevance. The research model suggests that every variable affected the overall behavioral intention to use LMS, whether directly or indirectly. The initial results emphasized the applicability and effectiveness of using TAM to measure and predict behavioral intention to use LMS.

Alomary (2017) used TAM to develop a comprehensive model, moderated by 11 factors, that identifies the antecedents of student motivation and acceptance of tablet computer use in learning contexts. The factors in this model are: actual usage; behavioral intention to use a tablet for learning; attitude toward using a tablet for learning; confidence; enjoyment; willingness; usability (intrinsic motivation); usefulness; identity; mobility; and achievement (extrinsic motivation). A number of other moderating variables were also taken into account, namely, experience, skill, knowledge, accessibility, curriculum, university utilization, teacher's role, and device characteristics. The study concluded that, by integrating the motivational factors and moderating variables, the results of this study will yield significant and useful findings related to students' motivation to use tablets and their overall acceptance of using tablets in higher education settings. Asiri (2012) developed a theoretical framework based on TAM and TRA that sought to understand the factors

influencing the utilization of the Jusur Learning Management System (Jusur LMS) in Saudi universities. The framework provided insights into the external and internal factors influencing the use of Jusur LMS for teaching and learning purposes, with the study claiming that its theoretical framework could be adapted to suit the requirements of other similar studies related to the planning and implementation of educational technology programs.

Identifying which factors significantly impact students' use of technology is vital for a better understanding of what educators should take into account when adopting new classroom technologies. Al-Harbi (2011) studied the factors influencing Saudi university students' intentions to use technology in a quantitative study of 531 students from multiple departments. The results showed that the students' attitudes toward using technology were the most important factor in determining their intention to use said technology. Binyamin, Rutter, and Smith (2017) investigated the factors associated with student teachers' use of LMS at King Abdulaziz University in Jeddah, Saudi Arabia. More than 120 male and female student teachers participated, and the study showed PU and PEU were predictors of the participants' attitudes. The quantitative study found also an association between the students' actual use of LMS and the following external variables: prior experience of LMS; satisfaction; social influence; computer self-efficacy; and teacher's role.

Alenezi (2011) investigated the influence that psychological, social, technical, cultural, and institutional factors had on students' acceptance of technology at Saudi universities. The findings suggested that higher education institutions should take into consideration the influence that technological, institutional, social, and psychological factors play in the process of implementing new technologies. Seliaman and Al-Turki (2012) investigated Saudi students' use of mobile phones and tablets for learning purposes. Sixty male students from a college computer science and information technology program participated in this quantitative study, and the findings indicated that perceived innovativeness did not have a significantly positive correlation with perceived usefulness of mobile learning.

Discussion and Conclusion

TAM has proven to be a useful theoretical model for understanding and explaining how users adapt technologies in a variety of fields. This study highlights the effectiveness and importance of TAM, and suggests it could be a viable framework for guiding the use and implementation of technology in educational settings, including special education institutions. The current research offers insight into the factors that can be used as reliable predictors of user acceptance for new technology. This model could be of practical benefit when the Ministry of Education is designing future projects and policies for increase adoption of technology across all Saudi schools. The literature review also shows that it is

necessary to adapt TAM for use in special education studies. The lack of studies using TAM in a Saudi educational context suggests that further investigation is necessary in this area (Alharbi, 2013a; Alshmrany & Wilkinson, 2017). A future study that builds on and extends TAM by adding factors will allow for a greater understanding of the phenomenon and explain a greater proportion of variance (Alharbi & Drew, 2014; Aljuaid et al., 2014; Attis, 2014; Colvin & Goh, 2005; Davis et al., 1989; Holden & Karsh, 2010; Nair & Das, 2012). Variables such as teachers' attitudes towards the use of technology with students with disabilities, teaching style, system quality, and teacher workload are potential factors that could contribute to the growing body of knowledge in the field of technology integration in schools in general, and in Saudi Arabia specifically.

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ملخص الدراسة:

يعتبر نموذج تقبل التقنية أحد أكثر النماذج شهرة في مجال تقبل التقنيات ونظم المعلومات، حيث تم استخدامه من قبل العديد من الدراسات في جميع أنحاء العالم لاستكشاف مستويات تقبل التقنية في بيئات مختلفة. يتكون نموذج تقبل التقنية من خمسة مجالات وهي: ادراك الفائدة، ادراك سهوله استخدام، الاتجاهات، النيه، والاستخدام. تمكن هذه العوامل الخمسة الباحثين بالتنبؤ حول كيفية تبني التقنية وقبولها بسهوله في سياقات متعددة. استخدمت العديد من الدراسات حول العالم هذا النموذج كإطار لفهم كيفية تسريع اعتماد التقنية بين معلمين التربية الخاصة وطلابهم من ذوي الإعاقة، وبالرغم من ذلك، عدد قليل جداً من الدراسات التي تناولت هذا النموذج في مجال التربية الخاصة في المملكة العربية السعودية. تهدف هذه الدراسة الى توضيح اهمية استخدام نموذج تقبل التقنية في مجال التربية الخاصة من خلال، أولاً؛ عبر شرح الخلفية النظرية لهذا النموذج وتوضيح مكوناته وتعريفاته ووظائفه ومزاياه. ثانياً؛ تقديم امثله لابرز الدراسات الحديثه التي طبقت هذا النموذج كإطار نظري في المحتوى السعودي، وبناء على نتائج هذه الدراسة سيتم تقديم التوصيات والدراسات. المقترحة في المستقبل

الكلمات الافتتاحية: نموذج تقبل التقنية، التربية الخاصة، التقنية المساعدة.