



THE EFFECTIVENESS OF USING ADVANCED ORGANIZATIONS WITHIN THE VIRTUAL CLASSROOM TO ENHANCE THE ACCEPTANCE OF TECHNOLOGY DURING DISASTERS

Marwa Yasien Helmy Elbyaly¹ and Abdallah Ibrahim Mohammed Elfeky²

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ABSTRACT

The situation in higher educational institutions has changed in many countries affected by natural disasters. During the new Corona pandemic, these institutions introduced many electronic solutions to continue the educational process. Studies in recent years have also shown many benefits of virtual classrooms. However, the studies that explored the effect of some methods of presenting educational material to the learner, such as advanced organizations, which may have an impact on learning outcomes in virtual classrooms, are still insufficient. Therefore, the current study aimed to identify the effectiveness of advanced organizations within the virtual classroom to enhance the acceptance of technology during disasters. The sample of this study consisted of (200) students in the optimal investment diploma who are enrolled in the digital applications course. After dividing them randomly into two, equal groups. The first group studied the course through virtual classrooms supported by advanced organizations. The second group studied the course through virtual classrooms without the use of advanced organizers. The technology acceptance model factors questionnaire tool was used to achieve the objective of the current study. The results revealed strong supporting evidence for the proposed extended technology acceptance model. The applicant organizations had a significant and direct positive impact on the perceived usefulness and perceived ease of use of the virtual classroom. The perceived ease of use also had a significant and direct positive effect on the perceived benefit of virtual classrooms as a result of the use of advanced organizers. The perceived benefit further reinforced both the behavioral intention and the tendency to use the virtual classroom for the students of the first group. The perceived ease of use reinforced both the usage orientation (directly) and the behavioral intention (indirectly) to use the virtual classroom for students of the same group as well.

Keywords: Advanced organizations; virtual classes; technology acceptance; Disaster time

¹Centre for Sharia, Educational and Humanitarian Research Center, Najran University, Najran, Saudi Arabia
Marwa.mohamed1@spe.kfs.edu.eg, <https://orcid.org/0000-0001-5521-8494>

²Department of Curriculum and Instruction, College of Education, Najran University, Najran, Saudi Arabia
abdallah.elfeqi@spe.kfs.edu.eg, <https://orcid.org/0000-0001-9208-8537>

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INTRODUCTION

Novel coronavirus (COVID-19) is the disease caused by the SARS-CoV-2 virus. Which appeared for the first time in November 2019 AD in the Chinese province of Wuhan and quickly spread to most countries of the world [1, 2]. Moreover, if this virus represents a direct threat to health, security, job opportunities, etc., then education is considered one of the sensitive areas that have been greatly affected by this epidemic [3]. To limit the spread of the COVID-19 epidemic from person to person, many countries have taken extensive measures [4, 5]. Specifically, the Kingdom of Saudi Arabia announced the closure of all schools and higher education institutions in the second semester, starting from March 9, 2020. The closure continued throughout the summer semester in all universities.

Many educators also see virtual classrooms as essential to the future of education. It has positively affected university communities by spreading optimism that may lead to a new era in university education [6, 7]. Virtual classrooms aim to facilitate seamless interaction between teachers and learners in real time with the support of modern technology and IT infrastructure [8, 9]. Virtual classrooms operate through several applications that have been developed [10, 11]. Collaborate Ultra Experience LTI is the most widely used application for virtual classroom delivery and is preferred by many educational institutions around the world due to its accessibility through mobile communication devices [12, 13]. This application is used by integrating it into the Blackboard e-learning management system. This application is a unique addition to teachers in universities that use the Blackboard system, as it provides the ability to hold virtual meetings, live lectures, and video conferencing.

The virtual classroom allows for a chat room, live audio and video broadcasting, white boarding, application sharing, synchronous web browsing, and feedback [14, 15]. Studies in recent years have also shown many benefits of virtual classes compared to traditional classes [16-18]. Virtual classroom activities are supported and restrictions

are reduced or removed to some extent with the development of technology (internet connection speed, quality of virtual classroom applications) [8, 19]. Virtual classroom applications provide opportunities for users to create an online community where they can communicate interact and mutually exchange ideas and opinions [8, 20]. Multiple applications for virtual classrooms have also been developed to be used by integrating them into e-learning management systems [10, 21, 22]. Such as the Collaborate Ultra Experience LTI virtual classroom app that was developed during the novel coronavirus pandemic. As it was implemented from the beginning of the summer semester of 2020 AD at the University of Najran by integrating it with the Blackboard e-learning management system. When relying on virtual classes as an alternative to the traditional method, lecturers and students do not have to commute to the university campus, thus enjoying the freedom and flexibility offered by the virtual learning environment [23]. This flexibility in the virtual classroom ensures continuity of education and enhances student retention [24]. Virtual classrooms also offer the potential to include experience outside the educational institution, meaning that students are exposed to a broader range of perspectives and ideas that allow for richer learning experiences [25].

The advanced organizer is also designed to facilitate meaningful learning by activating existing prior knowledge allowing the student to easily understand and remember new information [26]. The use of an advanced organizer with the lecture provides students with a comprehensive view of the topic of the lecture, and helps them to identify, understand and follow the main components of it [27]. That is, it makes the educational process meaningful by activating learners' prior knowledge in a new educational context [28].

Studies have shown that information can be encoded in memory and understood better if it can be linked to prior knowledge. Moreover, the Advanced Organizer is an ideal tool for that [29]. The term advanced organizer is defined as a learning activity that helps build or reinforce learning [30]. The advanced organizer is a strategy that helps to build bridges between educational units and others to link the newly acquired information with the current knowledge structure of the learner [31]. The main goal of using the Advanced Organizer in teaching is to help learners make unfamiliar information perceivable. Which makes their main goal is to control ideas and information because most concepts and principles are presented to them directly [32]. An advanced organizer can also be a guide or standard that enhances cognition by making a scheme that allows the learner to process and retain new information [26]. With an advanced organizer, a teacher can provide students with a conceptual framework that makes learning and retention of knowledge easier. Thus, learners can organize their old knowledge and familiar ideas and then associate any new idea or information with these ideas [33].

With the increasing development of technology, especially information and communication technology, and its integration into the private and professional lives of users, the decision to accept or reject it remains an open question [34, 35]. Although ICT has, the potential to greatly assist students in their learning, its effectiveness ultimately depends on the degree of its acceptance and use among the target groups [36]. Enhancing learner acceptance of technology is crucial for educational institutions that consider e-learning a major part of their strategic plan [37]. Ultimately, the effectiveness of virtual classes (as a form of e-learning) will depend on the degree of acceptance and use of the intended participants [38]. A different theory of technology adoption, such as the Technology Acceptance Model (TAM), is used to test the degree of technology acceptance and use of learners participating in e-learning environments [39, 40]. The TAM is the most widely used theory in the e-learning acceptance literature [41]. In a complex relationship between the use of a potential e-learning environment and its characteristics (external variables), the TAM assumes a mediating role for two variables, perceived ease of use and perceived usefulness. The TAM model also played a leading role in explaining users' behavior towards technology, a model derived from the theory of reasonable action and the theory of planned behavior [42-44].

Although many researchers have emphasized the benefits of large virtual classes in enhancing different learning outcomes [12, 45-47]. Studies concerned with the effect of methods of providing educational material to the learner, such as advanced organizations, are still insufficient, which may have an impact on learning outcomes in virtual classrooms, such as technology acceptance.

RESEARCH PROBLEM

To teach the "Digital Applications" course during the emerging Corona pandemic, researchers had to think of a suitable alternative to switch from traditional learning to e-learning. Bearing in mind that the acceptance of the students (study sample) of the used technological alternative will determine the extent of their use and benefit from this alternative.

RESEARCH IMPORTANCE

- Employing methods of presenting the educational material in e-learning environments, in a way that contributes to achieving the targeted learning outcomes.
- Directing attention towards benefiting from advanced organizations in the virtual classroom when relying on e-learning systems in university education.

- Expanding the TAM technology acceptance model in advanced organizations as an external variable or factor. It examined the effect of this factor on perceived ease of use, perceived usefulness, attitude, and behavioral intention to use virtual classrooms.

RESEARCH LIMITS

Objective Determinants

This current study is limited to an attempt to explore the effectiveness of advanced organizations in virtual classrooms on enhancing the acceptance of technology in the “Digital Applications” course for students of the Diploma in Optimal Investment during Disasters (Covid-19). The TAM technology acceptance model has also been extended to advanced organizations as an external variable. The study examined the effect of this factor on perceived ease of use, perceived usefulness, attitude, and behavioral intention to use virtual classrooms.

Human Determinants

Optimum Investment Diploma students in the Department of Curricula and Teaching Methods.

Temporal Determinants

The temporal limits are in the summer semester 2020.

Spatial Determinants

Department of Curriculum and Teaching Methods, Najran University.

RESEARCH TERMS

Advanced Organizer

An advanced organizer is anything that provides a simple overview of upcoming information, that can be understood before starting a study, and that helps connect new information to prior knowledge [48, 49].

Virtual Classes

The virtual classroom is an internet-based learning environment that aims to facilitate smooth, real-time interaction between teachers and learners with the support of modern technology and IT infrastructure [8, 50].

Tam Technology Acceptance Form

The Technology Acceptance Model (TAM) is an effective and accurate predictive model for understanding users' acceptance of technology in different contexts [51, 52].

Covid-19

COVID-19 is defined as a disease that causes sore throat, fever, cough, and shortness of breath. Symptoms appear 2 to 14 days after exposure, and may lead to death [1].

METHODOLOGY

The semi-experimental approach was used, this required the use of a pre-post design using two equal groups, and this is shown in Table 1.

Table 1: The quasi-experimental design of the study

	Pre-test	Treatment	Post-test
The first experimental group	TAM factors questionnaire	Advanced organizations within the virtual classroom	TAM factors questionnaire
The second experimental group		virtual classes	

Research tool (TAM Technology Acceptance Model Factors Questionnaire)

The researchers designed the TAM factor questionnaire to consist of four main factors. The design of the questionnaire was based on a literature review and previous studies for the development of TAM agents. All factors adapted to the research of Tarhini, Hone [38], Davis [53], Galib, Hammou [54], Masadeh and Elfeky [55], Elfeky and Elbyaly [56].

The questionnaire was presented to a group of experts and specialists to ensure its validity. Where the arbitrators were asked to express their opinions in the questionnaire in terms of the appropriateness of the items under each factor to measure this factor of TAM factors. The clarity of the phrases of the elements and the soundness of their linguistic formulation, and what can be added or deleted from those elements, and any other observations or suggestions. The final form of the questionnaire consisted of four factors, namely perceived ease of use (4 items), perceived usefulness (4 items), attitude towards use (4 items), and behavioral intention (3 items). A five-five Likert scale (from 1=strongly disagree to 5=strongly agree) was used for each item of the questionnaire.

The stability of the questionnaire was verified using Cronbach's Alpha for the internal consistency of the elements, by applying the questionnaire (electronically via the Blackboard system) to a survey sample not included in the actual study (30 students). The value of the reliability coefficient was (0.87) for the questionnaire as a whole.

Ensure that the Two Groups are Equal in Accepting the Technology

Pre-application of TAM factors questionnaire including perceived ease of use, perceived usefulness, attitude towards using virtual classrooms, and behavioral intention to use virtual classrooms to all students. And by analyzing the extracted data through the Structural Equation Model (SEM) using Multiple-group Confirmatory Factor Analysis (CFA) for the variables of the original TAM model (Perceived ease of use (PEOU), Perceived usefulness (PU), Attitude toward using (ATT), Behavioral intention (BI)). This is through IBM SPSS AMOS 24.0.

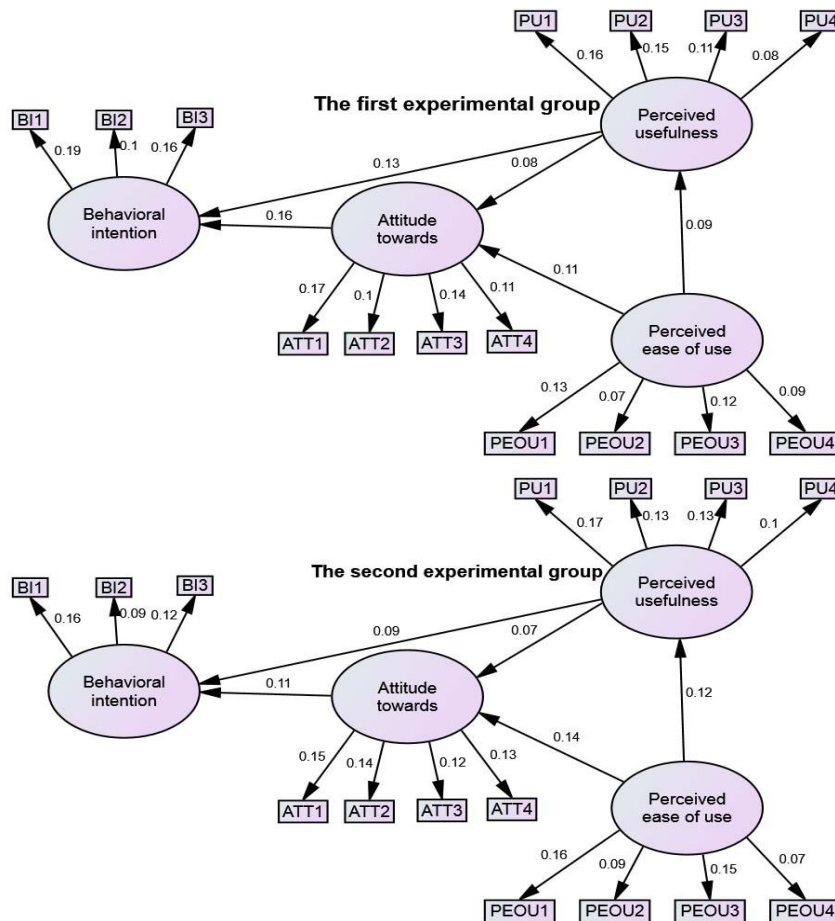


Figure 1: Multiple-group CFA for TAM agents

CMIN (χ^2)/df = .97 (CMIN = 192; df = 193; p = 0.613) ,IFI = 98 ,PRATIO = .96 ,CFI = 0.99 ,RMSEA = 0.042

The previous figure reveals that the perceived benefit in the first experimental group was weakly affected by the perceived ease of use ($\beta = 0.09$, $p > 0.05$). In addition, the perceived benefit in the second experimental group was weakly affected by the perceived ease of use ($\beta = 0.12$, $p > 0.05$). The trend toward use in the first experimental group was weakly affected by both perceived ease of use ($\beta = 0.11$, $p > 0.05$) and perceived usefulness ($\beta = 0.08$, $p > 0.05$). This is what happened in the second experimental group, where the attitude towards use was weakly affected by both the perceived ease of use ($\beta = 0.14$, $p > 0.05$) and the perceived usefulness ($\beta = 0.07$, $p > 0.05$). Finally, the behavioral intention in the first experimental group was weakly affected by both the attitude toward use ($\beta = 0.16$, $p > 0.05$) and the perceived usefulness ($\beta = 0.13$, $p > 0.05$). This also happened in the second experimental group, where the behavioral intention was weakly affected by both the attitude towards use ($\beta = 0.11$, $p > 0.05$) and the perceived usefulness ($\beta = 0.09$, $p > 0.05$). That is, all participants were homogeneous in accepting the technology before exposure to the experiment.

Experimental Processing Material

Lectures were delivered via synchronous virtual classrooms for the first experimental group with demonstrative advanced organizers, to provide the students with some basics to help them build their perceptions regarding the newly introduced topic. This is done by summarizing the topics of the lectures (to allow presenting new concepts in a clearer manner by summarizing their definitions, origins and characteristics, taking into account clarity and comprehensiveness). Presenting that summary at the beginning of the lecture in a schematic way (through a set of slides that precede the slides that present the content of the lectures, and are presented to students through sharing the application in the virtual classes). With a verbal explanation of that summary from the lecturer (via live audio broadcast in virtual classes). This is to try to establish links between previous knowledge and new information. This is followed by an oral explanation of the content slides of the lectures. Lectures were also provided through

synchronous virtual classes for the second experimental group, but without advanced organizers. The lectures were presented through slides that present the content and were also presented to the students through sharing the application in the virtual classes, with an oral explanation of the lecture slides via live audio broadcast in the virtual classes. Chat rooms were also used (where students discuss together in groups through virtual classrooms about learning tasks related to the skills of integrative science operations such as writing main questions, documenting references and sources, identifying influencing variables, controlling extraneous variables, writing zero and alternative study hypotheses, describing the experimental design Proposal, identification of data collection tools, data processing or results). The use of the whiteboard, simultaneous web surfing (to look for examples of tasks learned in the previous literature available via the web), and feedback in the virtual classrooms were equally used for both groups.

Statistical Processing

A Structural Equation Model (SEM) using Multiple-group Confirmatory Factor Analysis (CFA) was used to factor the TAM expanded into organizations developed as an exogenous variable (perceived ease of use, perceived usefulness, attitude toward use, and behavioral intention). This is through IBM SPSS AMOS 24.0.

RESULTS

The dimensional arithmetic mean scores of the study sample were extracted on the TAM factors questionnaire by group (first experimental, second experimental), then the Modified gain ratio was calculated. SEM using Multiple-group CFA of TAM factors expanded in advanced organizations was used as an exogenous variable (perceived ease of use, perceived usefulness, attitude toward use, and behavioral intention). This is through the AMOS 24.0 program. The following figure shows that the perceived ease of use of the participants in the first experimental group was significantly affected by the use of advanced organizers in the virtual classroom ($\beta = 0.98, p < 0.001$). This is compared to the perceived ease of use of the participants in the second experimental group, which was affected by the use of virtual classes (without advanced organizers) to a lesser extent ($\beta = 0.57, p \leq 0.05$).

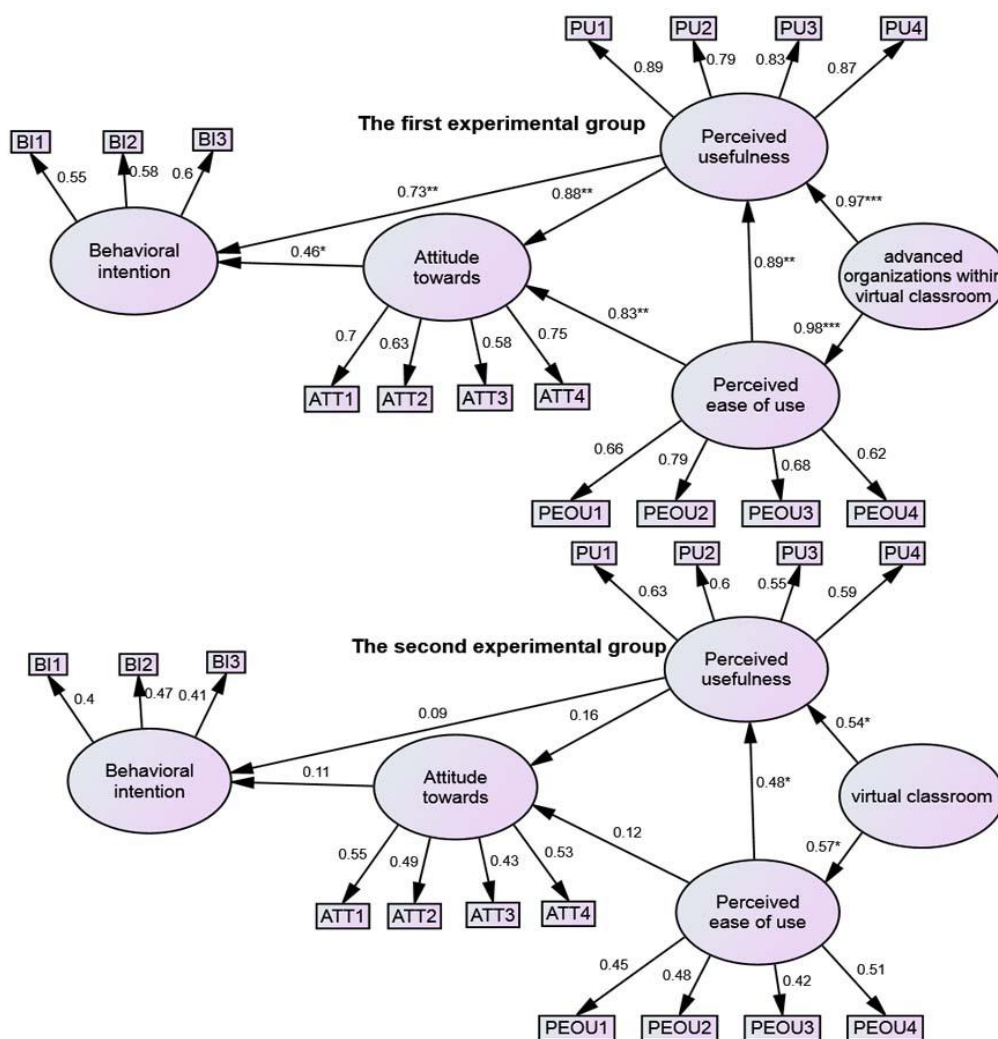


Figure 2: Multiple-group CFA for expanded TAM agents

CMIN (χ^2)/df = .96 (CMIN = 88; df = 191; p = 0.594), IFI = 97, PRATIO = .98, CFI = 0.96, and RMSEA = 0.039

The previous figure also shows that the perceived benefit of the participants in the first group was significantly positively affected by the use of advanced organizers in the virtual classroom ($\beta = 0.97, p < 0.001$). This was compared to the perceived benefit of participants in the placebo group who were affected by using virtual classes (without advanced organizers) less ($\beta = 0.54, p \leq 0.05$). At the same time, the results show that the perceived usefulness of the students in the first experimental group was significantly positively affected by the perceived ease of use ($\beta = 0.89, p < 0.01$). This is in contrast to the perceived benefit of students in the second experimental group, which was less affected by the perceived ease of use ($\beta = 0.48, p \leq 0.05$).

The results shown in the previous figure also show that the students' attitude towards use in the first group was positively affected by the perceived ease of use ($\beta = 0.83, p < 0.01$). This is in contrast to the trend towards use for students in the second group, which was weakly affected by the perceived ease of use ($\beta = 0.12, p = 0.29$). The results also show the trend towards use for the students in the first experimental group were significantly positively affected by the perceived benefit ($\beta = 0.88, p < 0.01$). This is in contrast to the trend towards use for students in the second experimental group, which was weakly affected by perceived usefulness ($\beta = 0.16, p = 0.18$). The results also show that the behavioral intention of the students in the first experimental group was positively affected by the attitude towards use ($\beta = 0.46, p \leq 0.05$). This is in contrast to the behavioral intention of students in the second experimental group, which was weakly affected by the attitude towards use ($\beta = 0.11, p = 0.23$). Finally, the results shown in the previous figure indicated that the behavioral intention of the students in the first group was significantly positively affected by the perceived benefit ($\beta = 0.73, p < 0.01$). This is in contrast to the behavioral intention of students in the second group, which was weakly affected by perceived usefulness ($\beta = 0.09, p = 0.68$).

DISCUSSION

The results revealed the interesting fact that the current study expanded the scope of the original TAM as proposed by Shorfuzzaman, Hossain [57], Verma, Bhattacharyya [58] by introducing advanced organizations as an exogenous variable. Subsequently, the results found that the applicant organizations had a significant and direct positive impact on the perceived usefulness and perceived ease of use of the virtual classroom. The perceived ease of use also had a significant and direct positive effect on the perceived benefit of virtual classrooms because of the use of advanced organizers. The perceived benefit also reinforced both the behavioral intention and the attitude towards using the virtual classrooms for the students of the first experimental group who benefited from the advanced organizations also. Thus, faculty members in particular should be aware of the importance of using advanced organizers in virtual classes rather than simply using those classes in general to present the educational material to the learners.

The results of this study support the findings of a number of previous studies that expanded TAM with many different exogenous variables. [59] expanded TAM with motivation and experience as exogenous variables. Which indicated that both stimulus and experience had an impact on both perceived ease of use and perceived usefulness, and they all significantly influenced behavioral intention to use. Perceived ease of use affected perceived usefulness significantly as well. Rafique, Almagrabi [60] expanded TAM with application quality and routine as exogenous variables. Which proved that these external variables affect the intention to use through the perceived benefit and perceived ease of use, which directly and significantly predict the trend towards use. Sagnier, Loup-Escande [61] expanded TAM with some aspects of virtual reality as an exogenous variable. Which emphasized that some of these aspects affected the intention to use virtual reality through the perceived benefit. The study of [54], which also expanded TAM with a number of extrinsic variables, including the perceived risk variable, which proved to have a significant impact on behavioral intention to use, through perceived benefit, perceived ease of use, and attitude towards use.

RECOMMENDATIONS

- Using the proposed model for TAM technology acceptance expanded by advanced organizations as an external variable.
- Paying attention to the behavioral direction and intention towards using new technology products, because the effectiveness of new technology in the educational process depends on the learners' attitude and behavioral intention towards using it.
- Perceived usefulness and perceived ease of use influence both attitude and behavioral intention to use, and are influenced by external variables. Therefore, it is important to pay attention to the external variables that positively affect TAM to ensure the promotion of the behavioral direction and intention to use new technology in the educational process.
- Further studies will explore the possibility of enhancing TAM by combining it with other exogenous variables.

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