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Nanda Eska Anugrah Nasution, M.Pd.

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Prof. Dr. Hj. Mukni'ah, M.Pd.I. NiP 19640511 199903 2 001 Jember, 17 Januari 2023 Ketua Jurusan Pendidikan Sains

Dr. Indah Wahyuni, M.Pd. NIP 19800306 201101 2 009

EXTENDING THE TECHNOLOGY ACCEPTANCE MODEL: RECENT ADVANCES

ARTICLE



By: Nanda Eska Anugrah Nasution NIP. 199210312019031006

FAKULTAS TARBIYAH DAN ILMU KEGURUAN
UNIVERSITAS ISLAM NEGERI KIAI HAJI ACHMAD SIDDIQ JEMBER
January, 2023

EXTENDING THE TECHNOLOGY ACCEPTANCE MODEL: RECENT ADVANCES

ARTICLE

This article is submitted to be presented at the periodic academic-forum organized by Fakultas Tarbiyah dan Ilmu Keguruan UIN KH Achmad Siddiq Jember



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Nanda Eska Anugrah Nasution NIP. 199210312019031006

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INTRODUCTION

A. Rationale

As one of the most significant frameworks for exploring concerns of technology acceptance and rejection, the Technology Acceptance Model (TAM; Davis, 1986, 1989) has been widely used in teaching and learning situations (Al-Emran et al., 2018). In the last three decades, the Technology Acceptance Model (TAM) has evolved as a credible model for analyzing the factors that influence user behavior and technology adoption. The Technology Adoption Methodology (TAM) is a reliable and valid model that has been extensively used to assess the adoption of different technologies (King, 2006). Technology Acceptance Approach (TAM) is believed to be the most prominent model applied to gauge students' attitudes towards embracing developing technology in diverse settings and disciplines. TAM might be used to examine students' perspectives. It consists of six aspects: perceived usefulness, perceived ease of use, attitudes towards the new technology, behavioural intention, actual system use, and external factors.

Numerous studies have validated TAM's effectiveness, and the model has become the standard for understanding determinants of user intention towards the adoption of a technology (Grani & Maranguni, 2019). TAM has lately been attacked for being an obsolete paradigm, despite its robustness and applicability across hundreds of research. It is crucial to establish if the TAM is outdated or still applicable at this time. Multiple research have extended the original TAM model. Trends that emerge in developing this model need to be explored further.

B. Writing Foci

The foci of this article are formulated using the question: How the Recent Advances in Extending the Technology Acceptance Model?

C. Writing objective

From the question formulated, this article aims to present thoughts and ideas related to the Recent Advances in Extending the Technology Acceptance Model

DISCUSSION

TAM is an information systems theory that explains how consumers learn to embrace and use a technology. TAM may be the most often used theoretical model in technology usage research (Essel, 2017). Numerous studies have evaluated TAM as a foundation theory for properly analyzing and investigating technological adoption. TAM is used in both the educational and non-educational sectors. TAM is a reliable and valid model that has been widely used to measure the adoption of various technologies (King, 2006). Several studies have used the TAM to examine the use of diverse technologies, including e-learning (Al-Gahtani, 2016), e-government, m-learning, wireless technology, web-based training, online banking, m-payment, and social media, among numerous others.

TAM has its roots in the philosophy of reasoned action (TRA). The TRA targets "behavioral intents" rather than "attitudes" since they are seen as the primary interpretation of behavior. The TAM argues, as a simplification of TRA, that users' choices to embrace a new information technology are based on two reasonable evaluations of its anticipated effects. (i) perceived usefulness, which is defined as the user's expectation that using a new information technology would lead to enhanced work performance, and (ii) perceived ease of use, which is defined as the extent to which an individual feels that utilizing a given system would be easy [Davis, 1989; Lingyun and Dong, 2008; Yuanquan et al., 2008]. Actual system usage is the point at which individuals use the technology. Behavioral intent is a component that motivates individuals to use the technology. The attitude (A), which is the broad perception of the technology, influences the behavioral intention (BI).

The original technology acceptance model

The original technology acceptance model is visualized in Figure 1

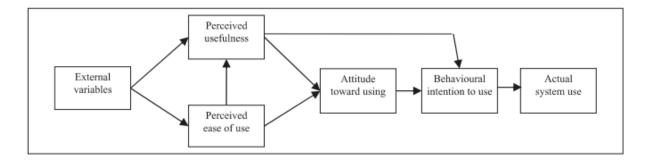


Figure 1. Technology acceptance model (Davis, 1989).

Perceived ease of use (PEU)

Perceived ease of use (PEU) is the extent to which a learner believes that utilizing a certain system requires no effort. Perceived ease of use (PEU) is significant for students since a user-friendly system will increase satisfaction and use frequency (Essel, 2017).

Perceived usefulness (PU)

Perceived usefulness (PU) is the extent to which a student believes that employing a certain system will enhance his or her learning performance (Davis, 1989). Davis et al. (1989) found that Perceived usefulness (PU) is a primary factor influencing people's intentions to utilize computers.

Attitudes toward using (AT)

In some circumstances, individuals' attitudes (or preferences) toward specific activities might have a considerable impact on their actions. TAM suggested that perceived usefulness (PU) and perceived ease of use (PEU) are two elements that influence attitudes toward using (AT) in technology-focused research.

Behavioral intention (BI)

Behavioral intention (BI) assesses the actual use (AU) of a certain technology system and, as a result, specifies technology acceptance. Behavioral intention (BI) is the extent to which a prospective learner has predetermined intentions to engage in or refrain from engaging in a certain future activity. The TAM recognizes behavioral intention (BI) as the most influential predictor of technology adoption behavior, and both attitudes toward using (AT) and perceived usefulness (PU) have a positive effect on behavioral intention (BI). According to Davis (1989), behavioral intention (BI) is the most accurate predictor of actual use (AU).

Actual use (AU)

The actual use (AU) is the precise degree of technology use. It is determined by the frequency and duration of technology use. The actual use (AU) represents the frequency of technologies the individual uses.

The Extended Technology Acceptance Model (Zhou et al., 2022)

The first Extended Technology Acceptance Model reviewed in this discussion is that developed by Zhou et al. (2022), seen in Figure 2.

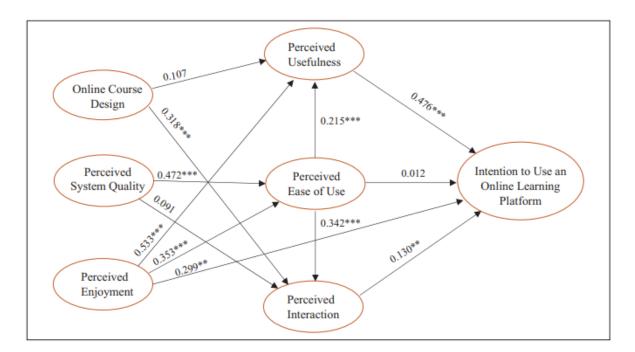


Figure 2. The Extended Technology Acceptance Model (Zhou et al, 2022).

*p<.1. **p<.05. ***p<.01.

Measurement Items Used in Zhou et al. (2022):

1. Online Course Design

- a. The course content is interesting.
- b. The course material satisfies my needs.
- c. The degree of difficulty of the course material is acceptable.
- d. I am pretty satisfied with the course material and quality.

2. Perceived System Quality

a. This platform is simple to use because to its intuitive user interface.

- b. The Platform's features satisfy my requirements.
- c. The Platform's functioning is consistent and trustworthy.
- d. I am generally pleased with the Platform's overall design.

3. Perceived Enjoyment

- a. I think that learning is more enjoyable using this platform.
- b. The real use of the Platform is pleasurable.
- c. I like studying on this platform.

4. Perceived Ease of Use

- a. I would have no trouble learning on this platform.
- b. It is simple for me to instruct the Platforms to do the actions I want.
- c. My interactions with the Platform are understandable and clear.
- d. In general, I find this Platform/application to be simple to use.

5. Perceived Usefulness

- a. Utilizing this Platform would enhance my academic achievement.
- b. Using this Platform would increase my learning efficiency.
- c. Using this platform would boost my learning efficiency.
- d. I found this Platform helpful for my education.

6. Perceived Interaction

- a. On the discussion board, I debate subjects and respond to questions posed by the instructor with other students.
- b. I participate in ongoing learning interactions using this Platform.
- c. Using the Platform allows me to exchange material relevant to course learning with others.
- d. In overall, I believe this platform offers excellent chances for user involvement.

7. Perceived Intention to Use

- a. In the future, I would want to utilize this Platform to study further courses.
- b. I will promote this Platform to others.
- c. I prefer this Platform over conventional learning methods.

The Proposed Extended Technology Acceptance Model (Almaiah et al., 2016)

This Proposed Extended Technology Acceptance Model reviewed is that developed by Almaiah et al (2016), seen in Figure 3.

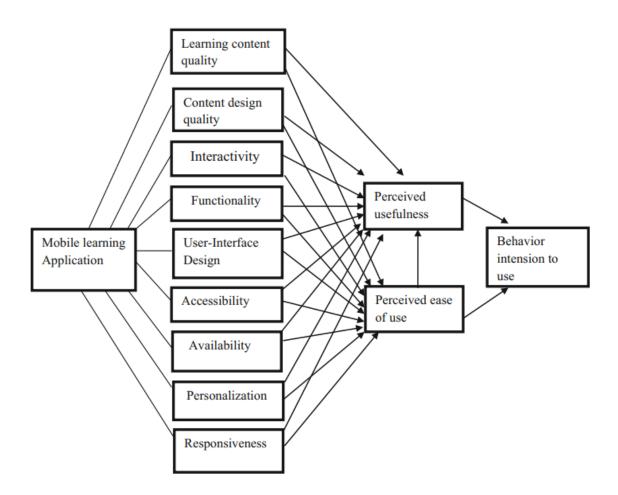


Figure 3. The Proposed Extended Technology Acceptance Model (Almaiah et al., 2016).

Almaiah et al (2016) found that learning content quality, content design quality, interactivity, functionality, user-interface design, accessibility, personalization, and responsiveness have significant effects on perceived usefulness of mobile learning (PU) and perceived ease of use of mobile learning (PEU), and availability has significant effects on perceived ease of use of mobile learning (PEU).

Measurement Items Used in Almaiah et al. (2016):

1. Learning Content Quality

- a. Mobile learning application may provide me comprehensive content.
- b. Mobile learning application can supply me adequate material.

- c. The mobile learning application includes multiple learning material activities.
- d. The mobile learning application gives comprehensive contact details.

2. Content Design Quality

- a. Text, audio, and video information are accessible through a mobile learning application.
- b. The mobile learning application can provide me with information that precisely meets your requirements.
- c. Mobile learning application gives up-to-date material.
- d. The material of the mobile learning application is correct.

3. Interactivity

- a. Application for mobile learning that is simple to discuss with your teachers.
- b. Application for mobile learning that facilitates discussion with other students.
- c. Mobile learning application that makes it simple to share knowledge with the learning community.
- d. The mobile learning application makes it simple to access the learning community's shared material.

4. Functionality

- a. Application for mobile learning that is suitable with several platforms.
- b. The mobile learning application facilitates navigating.
- c. A mobile learning application that facilitates text search.
- d. The interface's size and resolution are satisfactory.

5. User-interface Design

- a. The UI of the mobile learning application has appealing colors, pictures, and animations.
- b. The mobile learning application has graphic elements.
- c. The mobile learning application has intuitive menus and iconography.
- d. The mobile learning application has an attractive page layout.

6. Accessibility

- a. The mobile learning app allows me to download files.
- b. The mobile learning app allows me to upload files.
- c. Using Wi-Fi, mobile learning applications provide access to learning content and services.
- d. Mobile learning applications provide 3G and 4G access to instructional content and services.

7. Availability

- a. The mobile learning application gives me access to material and services for learning anywhere.
- b. The mobile learning application offers me with access to learning information at any time.

8. Personalization

- a. The mobile learning application gives teachers and administrators with the ability to send personalized messages.
- b. The mobile learning application enables me to study the desired material.
- c. The mobile learning application gives me the choice of selecting how I want to study.
- d. The mobile learning application allows me to monitor the progress.
- e. The mobile application tracks my performance.
- f. The preferences are stored by the mobile learning application.

9. Responsiveness

- a. Mobile learning application provides a prompt service.
- b. Mobile learning application always ready to assist me.
- c. Mobile learning application provides me exactly when services will be performed.

10. Perceived usefulness

- a. Using a mobile learning application would accelerate the completion of activities.
- b. Using a mobile learning application would enhance the learning environment productivity.
- c. Using a mobile learning application would boost the learning environment's efficiency.
- d. Using a mobile learning application would boost the learning environment effectiveness.
- e. Utilizing a mobile learning application would facilitate your participation in a learning environment.

11. Perceived ease of use

- a. The mobile application for education is simple to use.
- b. The interactions with the mobile learning application are transparent and easily comprehended.
- c. The mobile learning application is, in general, user-friendly.

12. Behavioral intention to use

- a. In the future, I aim to use mobile learning applications.
- b. I would want to promote mobile learning application services to others.
- c. Future use of mobile learning applications will be frequent.
- d. I will use mobile learning application frequently in the future.

The Extended Technology Acceptance Model (Nagy et al., 2018)

The third Extended Technology Acceptance Model reviewed in this discussion is that developed by Nagy et al (2018), seen in Figure 4.

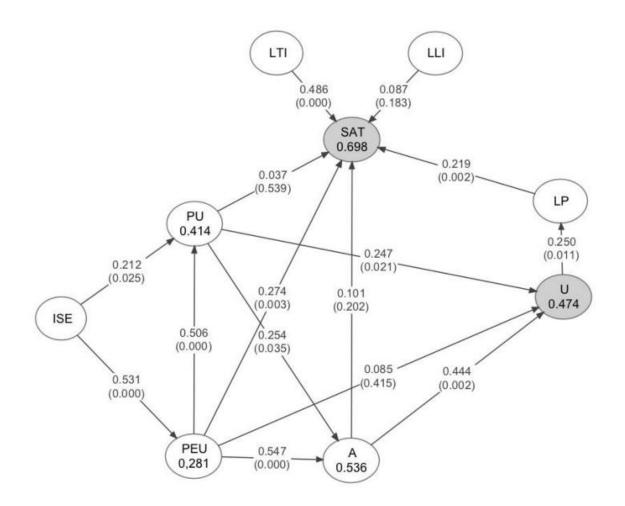


Figure 4. The Extended Technology Acceptance Model (Nagy et al., 2018).

Measurement Items Used in Almaiah et al. (2016):

1. Perceived Usefulness (PU)

- a. Using videos enhances my learning quicker.
- b. Videos supplement essential components of the instructional content.
- c. Using videos boosts my learning efficiency.

2. Perceived Ease of Use (PEU)

- a. Using the videos does not need a great deal of mental work.
- b. Overall, I believe the videos to be user-friendly.
- c. I find the interactivity of the videos to be adaptable.

3. Attitude (A)

- a. Considered as a whole, my use of videos for learning is good.
- b. Considered as a whole, my use of videos for learning is pleasant.
- c. Considered as a whole, my use of videos for learning is favourable.

4. Learning Satisfaction (SAT)

- a. I am happy with the videos' educational value.
- b. I believe that the videos effectively satisfy the learning goals.
- c. The videos have significantly helped to my development of important abilities.
- d. The videos increase my time spent learning.

5. Internet Self Efficacy (ISE)

- a. I comprehend Internet-related concepts and phrases.
- b. I am confident in my ability to acquire sophisticated Internet program abilities.
- c. When I need assistance, I visit an internet discussion forum.
- d. I can explain why a job cannot be performed through the Internet.

6. Learner-learner Interaction (LLI)

- a. I had multiple conversations with other students about the course material.
- b. I interacted with my classmates regarding the course material using a variety of communication platforms.
- c. I received a great deal of feedback from my classmates.

7. Learner-teacher Interaction (LTI)

- a. Throughout the semester, I had multiple sessions with the teacher.
- b. When necessary, I got sufficient input from my tutor.
- c. I posed my questions to the teacher utilizing various modes of communication.
- d. The teacher promptly responded to my queries.

8. Video Usage (U)

a. How often did you use the videos? (Possible answers ranged from "not at all" (1) to "daily or more often" (5))

9. Learning Performance (LP)

a. Your end-of-term grade: Answers (from 1 to 5) were arranged to be the same as the student's end-of-term grade.

Trend in Extended Technology Acceptance Model Research

The data in this section is derived from Al-Emran & Shaalan (2021). The technique used is bibliometric analysis. Due to the relevance of the data and the breadth of scientific areas covered, their study utilizes the Web of Science (WoS) database to gather relevant publications. The publishing years 2010–2020 are specified. It was possible to obtain 2,399 articles from all sorts of periodicals. To provide a full picture of the TAM and its uses, all publishing kinds were analyzed and taken into account.

Publications by years and most studied applications (2010–2020)

Figure 5 illustrates the TAM trend during the publishing years (2010–2020) and Table 1 displays the top 10 TAM applications (2010-2020).

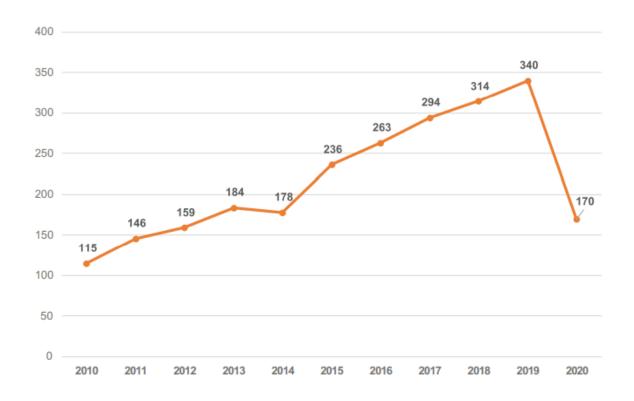


Figure 5. TAM Trend During the Publishing Years (2010–2020) (Al-Emran & Shaalan, 2021).

Table 1. Top 10 TAM applications (2010-2020) (Al-Emran & Shaalan, 2021).

Ranking	TAM applications	Count
1	Electronic commerce/e-commerce	146
2	Internet banking/online banking	120
3	Social media/social networks	105
4	E-learning	101
5	E-government	73
6	Mobile commerce/m-commerce	50
7	Mobile learning/m-learning	48
8	Mobile banking	38
9	Cloud computing	36
10	Augmented reality	29

Overall, the number of research on TAM and its applications is increasing, demonstrating that implementing, altering, and expanding the model across a variety of applications and domains remains valid. It is consequently anticipated that the upcoming years will be filled with many publications. Apparently, e-commerce is the application of TAM that has received the most research. Moreover, it is evident that TAM has lately been applied to developing technologies like as augmented reality.

Main Theories/Models Used with TAM (2010-2020)

Table 2 lists the ten most influential journals in TAM research, whereas Table 3 lists the principal TAM theories and models.

Table 2. Top 10 influential journals in TAM studies.

Ranking Journal Documents Citations Impact factor (2019) Computers in Human Behavior 4213 5.003 1 80 2 Computers and Education 32 2381 5.296 3 International Journal of Mobile 32 455 1.328 Communications 4 Sustainability 31 111 2.576 5 Advanced Science Letters 25 22 6 Behaviour and Information 25 561 1.781 Technology 7 Education and Information 25 98 Technologies 8 **IEEE Access** 22 87 3.745 9 Telematics and Informatics 18 362 4.139 Interactive Learning 10 15 290 1.938 Environments

Table 3. Main theories/models used with TAM.

Ranking	Theories/models	Count
1	Theory of planned behavior (TPB)	78
2	DeLone and McLean IS success model	47
3	Unified theory of acceptance and use of technology (UTAUT)	46
4	Diffusion of innovation (DOI)	44
5	Task-technology fit (TTF)	28
6	Expectation-confirmation model (ECM)	23
7	Theory of reasoned action (TRA)	20
8	Self-determination theory (SDT)	12
9	Social cognitive theory (SCT)	12
10	Flow theory	5

CONCLUSION

The Technology Acceptance Model is the most commonly used model of technology adoption. The Technology Acceptance Model has been modified in several ways, including by Zhou et al. (2022), Almaiah et al. (2016), and Nagy et al. (2018). Overall, the number of research on TAM and its applications is increasing, demonstrating that implementing, altering, and expanding the model across a variety of applications and domains remains valid. It is consequently anticipated that the upcoming years will be filled with many publications. Apparently, e-commerce is the application of TAM that has received the most research. Moreover, it is evident that TAM has lately been applied to developing technologies like as augmented reality.

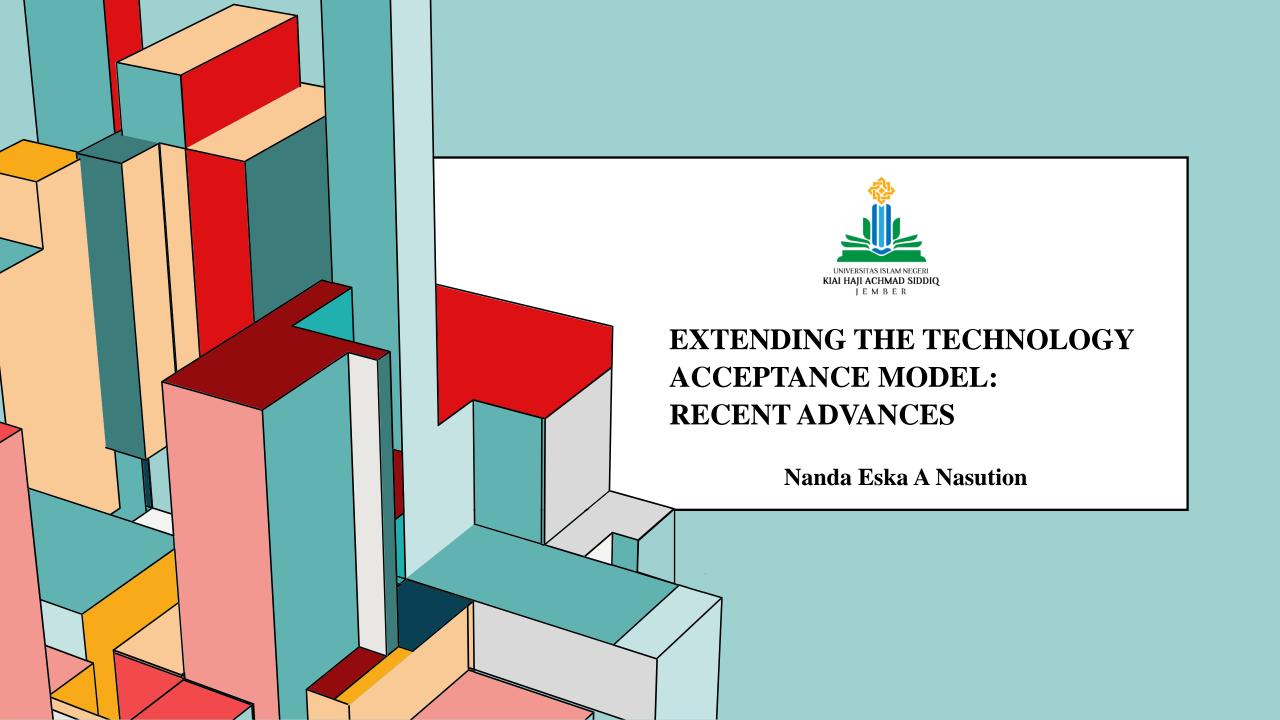
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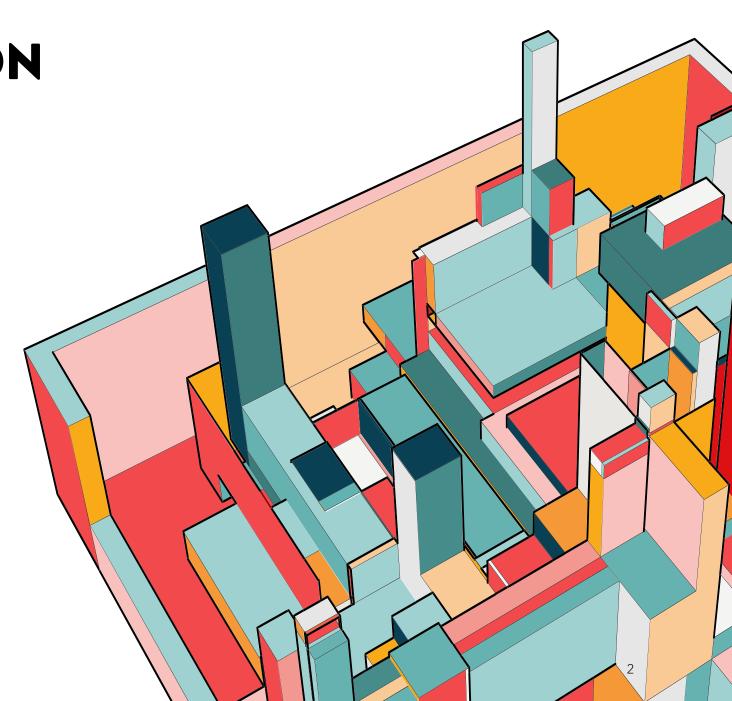
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 Sage Open, 12(1), 21582440221085259.
 https://doi.org/10.1177/21582440221085259



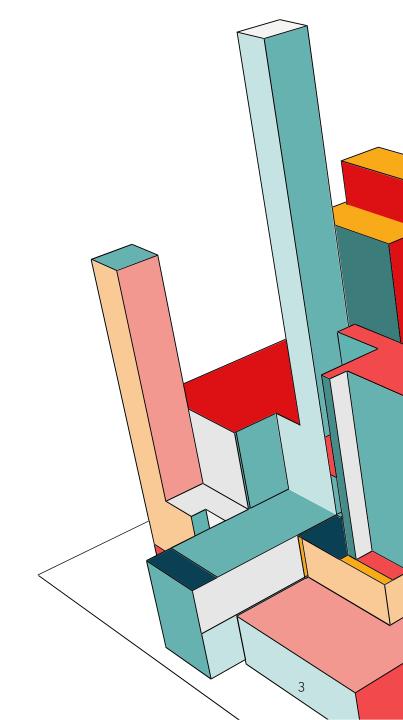
INTRODUCTION

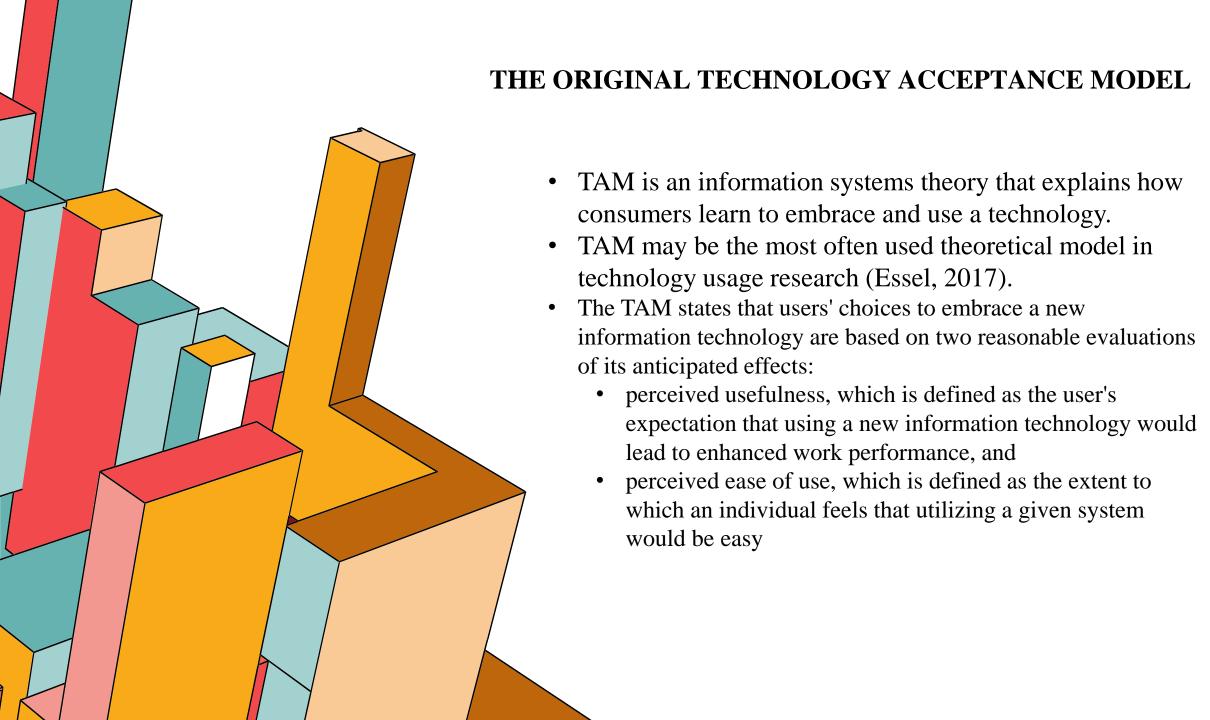
- As one of the most significant frameworks for exploring concerns of technology acceptance and rejection, the Technology Acceptance Model (TAM; Davis, 1986, 1989) has been widely used in teaching and learning situations (Al-Emran et al., 2018).
- Multiple research have extended the original TAM model.
- TAM has lately been attacked for being an obsolete paradigm, despite its robustness and applicability across hundreds of research. It is crucial to establish if the TAM is outdated or still applicable at this time.



WRITING FOCI

HOW THE RECENT ADVANCES IN EXTENDING THE TECHNOLOGY ACCEPTANCE MODEL?





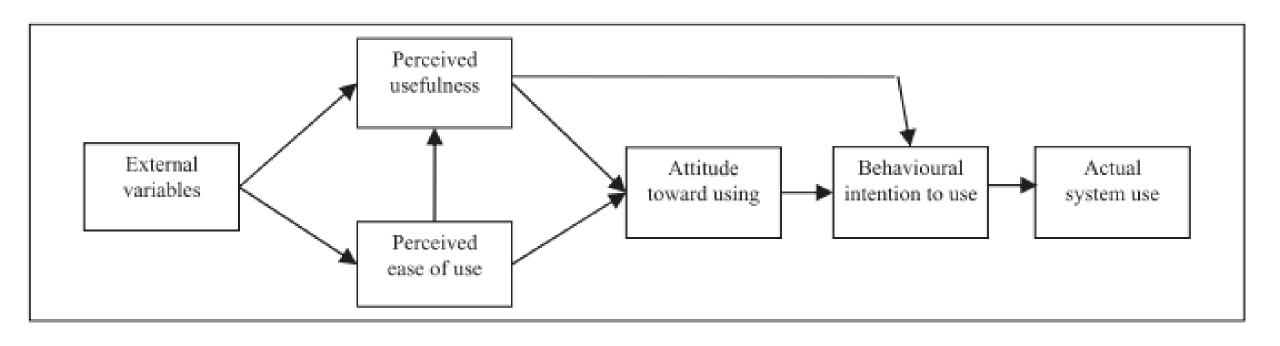
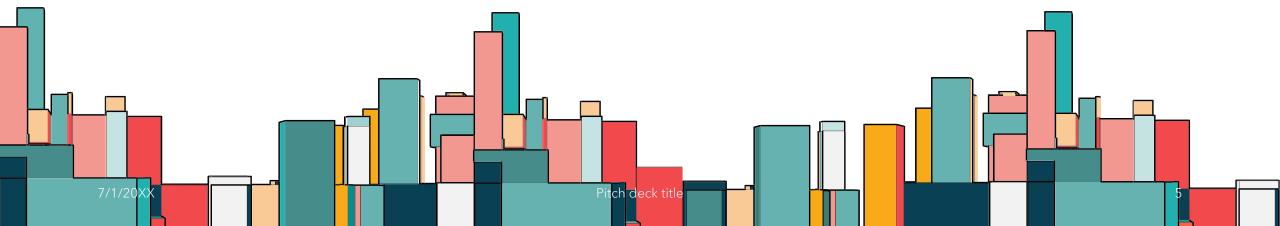
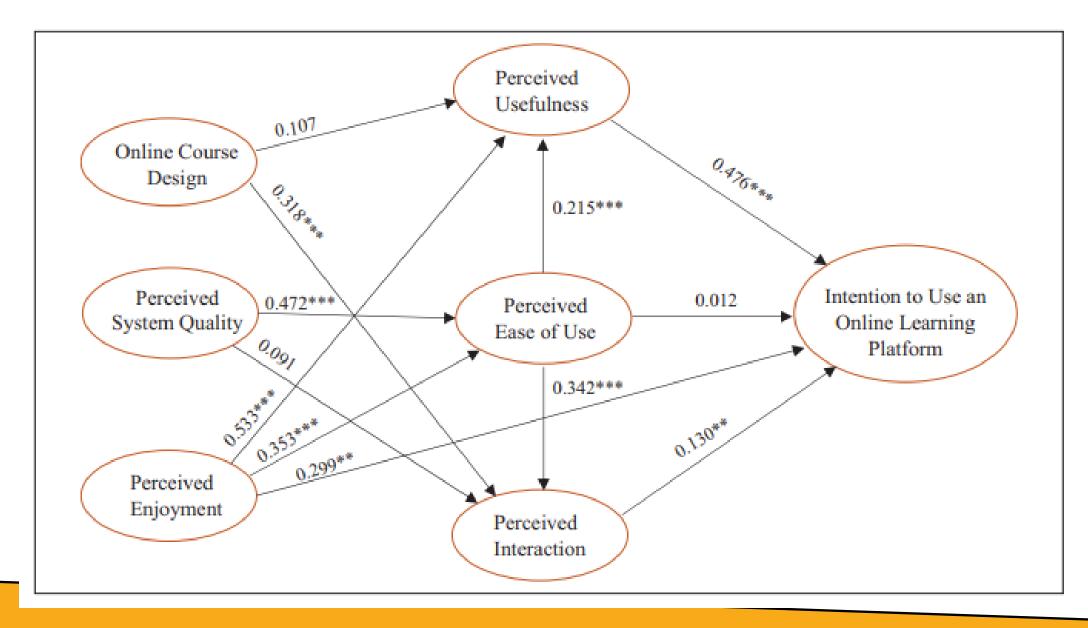
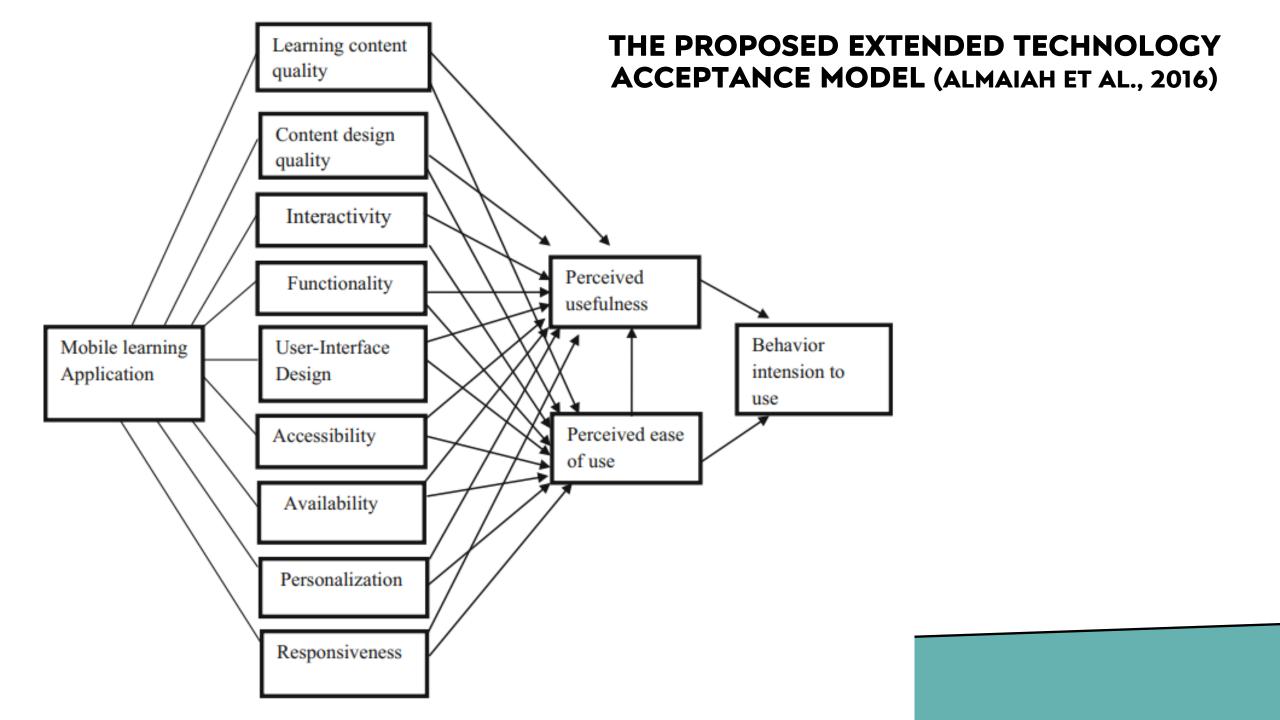


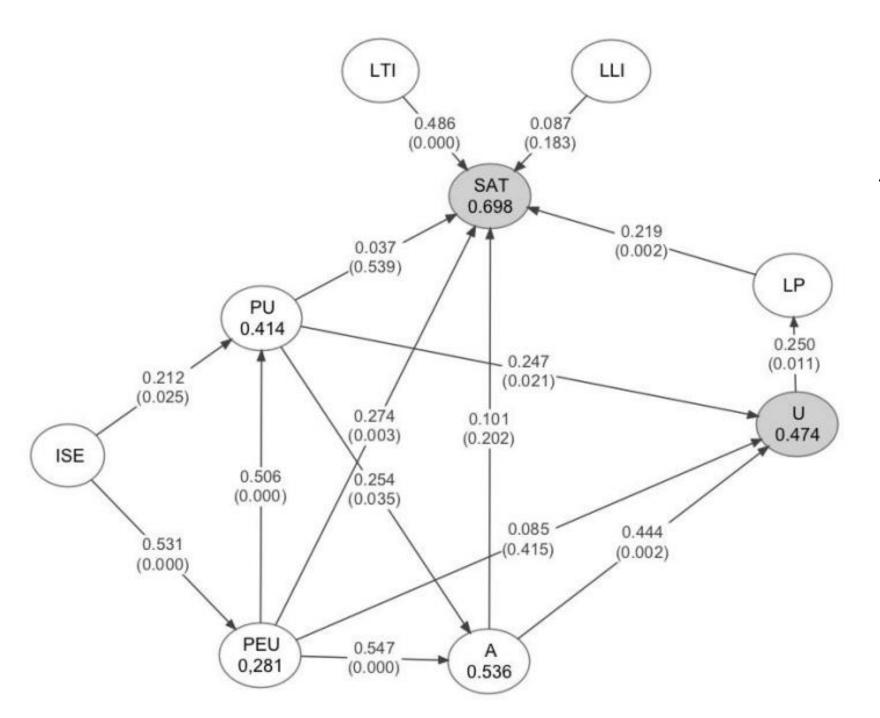
Figure 1. Technology acceptance model (Davis, 1989).



THE EXTENDED TECHNOLOGY ACCEPTANCE MODEL (ZHOU ET AL., 2022)



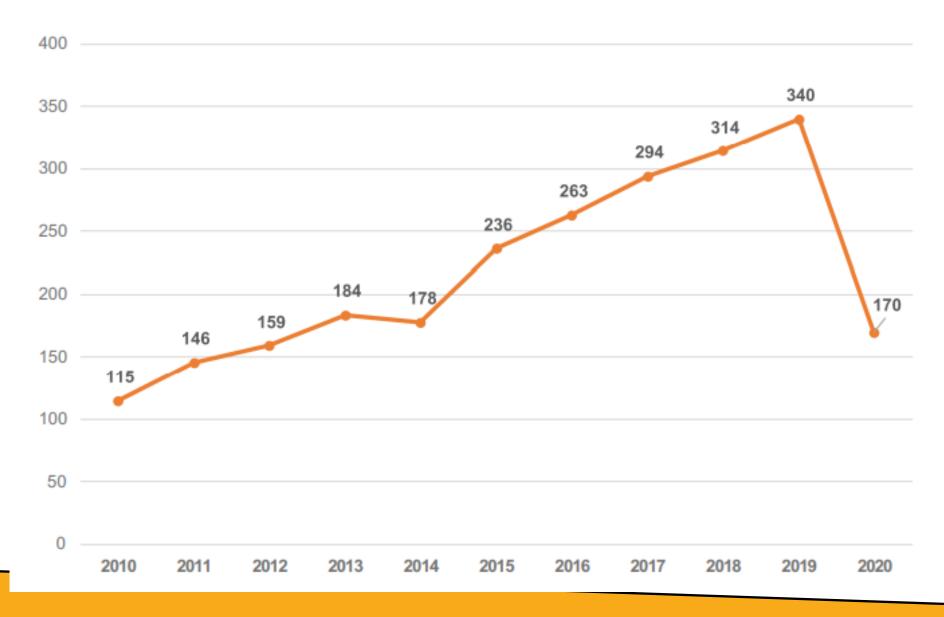




THE EXTENDED TECHNOLOGY ACCEPTANCE MODEL (NAGY ET AL., 2018)

- PERCEIVED USEFULNESS (PU)
- 2. PERCEIVED EASE OF USE (PEU)
- 3. ATTITUDE (A)
- 4. LEARNING SATISFACTION (SAT)
- 5. INTERNET SELF EFFICACY (ISE)
- 6. LEARNER-LEARNER INTERACTION (LLI)
- 7. LEARNER-TEACHER INTERACTION (LTI)
- 8. VIDEO USAGE (U)
- LEARNING PERFORMANCE (LP)

TREND IN EXTENDED TECHNOLOGY ACCEPTANCE MODEL RESEARCH



Ranking	TAM applications	Count
1	Electronic commerce/e-commerce	146
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5	E-government	73
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9	Cloud computing	36
10	Augmented reality	29

Top 10 TAM applications (2010-2020) (Al-Emran & Shaalan, 2021).

TOP 10 INFLUENTIAL JOURNALS IN TAM STUDIES

Ranking	Journal	Documents	Citations	Impact factor (2019)
1	Computers in Human Behavior	80	4213	5.003
2	Computers and Education	32	2381	5.296
3	International Journal of Mobile Communications	32	455	1.328
4	Sustainability	31	111	2.576
5	Advanced Science Letters	25	22	_
6	Behaviour and Information Technology	25	561	1.781
7	Education and Information Technologies	25	98	_
8	IEEE Access	22	87	3.745
9	Telematics and Informatics	18	362	4.139
10	Interactive Learning Environments	15	290	1.938

MAIN THEORIES/MODELS USED WITH TAM.

Ranking	Theories/models	Count
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