



## Journal of Advanced Research in Applied Sciences and Engineering Technology

Journal homepage:  
[https://semarakilmu.com.my/journals/index.php/applied\\_sciences\\_eng\\_tech/index](https://semarakilmu.com.my/journals/index.php/applied_sciences_eng_tech/index)  
ISSN: 2462-1943



# Students' Acceptance of Technological Devices for E-Learning During Covid-19 Pandemic in Malaysian Higher Education

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### ARTICLE INFO

#### Article history:

Received 22 May 2023

Received in revised form 15 September 2023

Accepted 23 September 2023

Available online 14 October 2023

#### Keywords:

Technological devices; e-learning; TAM

### ABSTRACT

During the pandemic, the majority of teaching and learning activities have transitioned to electronic platforms, utilizing technological devices. E-learning has emerged as a prominent tool for facilitating and managing these educational processes. Through e-learning, instructors can effectively handle student records, course materials, grading, and communication. This research focuses on examining students' acceptance of technological devices for e-learning in the context of higher education in Malaysia during the pandemic. The primary objective is to investigate students' acceptance and ongoing use of technological devices to support teaching and learning. The extended Technology Acceptance Model (TAM) is employed as the theoretical framework for descriptive assessment of students' acceptance. The study's findings reveal that students exhibit a positive attitude towards utilizing technological devices for e-learning during the pandemic.

## 1. Introduction

In March 2020, the Malaysian government implemented the Movement Control Order (MCO) in response to the Covid-19 pandemic, significantly impacting universities across the country. Within a short period, face-to-face learning was swiftly replaced by online learning to ensure educational continuity. The Ministry of Higher Education mandated that all public and private universities in Malaysia adopt online learning until the end of December 2020 [1]. While online learning has emerged as the primary solution in the "new norm" era, it is not without limitations. Challenges include the lack of personal interaction, reduced confidence in student understanding, limited facial expressions, and decreased student engagement compared to face-to-face learning [2]. The absence of direct teacher-student interaction has also become a present challenge [3-5].

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<https://doi.org/10.37934/araset.33.1.19>

Despite the implementation of online learning since the beginning of the MCO, many university students continue to face difficulties and encounter problems. Several studies have examined students' acceptance of online learning during the MCO period [6-8]. However, there is a lack of research focusing on the technological and device-related aspects of online learning. It is crucial to explore issues related to technology, such as students lacking computer ownership, limited access to reliable internet, variations in data usage (Wi-Fi or mobile data), and other associated challenges.

Previous studies have highlighted the disruptions and distractions experienced by students during online learning, including intermittent internet connectivity and poor network quality [5,9,10]. Consequently, it is necessary to investigate the acceptance and impact of technological devices on students, particularly within Malaysian public universities. This study will adopt the Technology Acceptance Model (TAM) while considering the integration of other relevant theories to provide a comprehensive understanding of the research topic.

## **2. Literature Review**

Individuals face significant risks when natural disasters like severe floods, earthquakes, or virus outbreaks occur, making it unsafe for them to venture outside their homes. As a result, a "new normal" lifestyle emerges as a necessity when these disasters persist for an extended period. The global community experienced such a shift during the COVID-19 pandemic in 2020, which compelled widespread changes in various aspects of life, including education and learning. While face-to-face interactions were previously the predominant mode of instruction, the prevailing circumstances necessitated a rapid adoption of online learning as a prevailing trend. This shift allowed knowledge dissemination to continue unhindered, benefiting communities at all levels, from schools to universities. However, despite the widespread adoption of educational technology during disaster situations, there remains a dearth of comprehensive discussions and research on this topic. While the Technology Acceptance Model (TAM) has been applied in understanding individuals' acceptance of technology in normal conditions (as evidenced by previous studies), its application in the context of disaster situations is relatively underexplored [11,12]. Consequently, there is a need for more studies that utilize the TAM framework to investigate the adoption of educational technology in disaster scenarios, thereby shedding light on the unique challenges and opportunities presented by such circumstances.

According to Hussein [14], the needs of students and teachers are different. Students must use the internet to look for information and download course-related resources. Students already have difficulties with the search process, and bad internet performance will make things worse [15,16]. They also need a suitable way to submit assignments and get feedback on submitted assignments. On the other hand, educators need robust educational technology applications for delivering learning content to students in a form that is accessible to them. It can be seen that educators need to master and have communication and information technology (ICT) literacy so that it is more practical, especially in disaster situations that require students and educators to work from home. Furthermore, the cloud storage technology can be utilized by both students and instructors to keep and share documents safely [18]. PEU in the TAM model emphasizes that the availability of tools or systems that are easier to use will encourage individuals' self-confidence to use them [5]. The easier it is to control technology, the greater the influence on individuals to adapt technology in learning and teaching [19,20].

## *2.1 Technology Acceptance Model*

The usage of the Technology Acceptance Model (TAM) in the field of education has been extensive and valuable in understanding technology adoption and acceptance among students, teachers, and educational institutions. TAM has provided a solid foundation for researchers to explore factors influencing the integration of technology in educational settings and to examine users' attitudes and intentions towards technology use.

TAM has been widely applied to study various educational technologies, including online learning platforms, learning management systems, educational apps, and digital tools. By assessing the perceived usefulness and ease of use, TAM helps researchers and educators understand the factors that influence technology acceptance and adoption in educational contexts.

Studies applying TAM in education have revealed important insights. They have identified the significance of perceived usefulness, highlighting the importance of how technology can enhance learning outcomes, increase engagement, and provide unique educational opportunities [13]. Additionally, the perceived ease of use has been shown to play a critical role in technology adoption, as users are more likely to embrace technologies that are intuitive, user-friendly, and require minimal effort to navigate [13].

Furthermore, TAM has been instrumental in investigating the role of other variables in technology adoption within educational settings. This study has extended the TAM framework to include additional factors such as convenience, compatibility, media richness and perceived self-efficacy [21-24]. These extensions have provided a more comprehensive understanding of the complex dynamics influencing technology acceptance in education.

The application of TAM in education has practical implications for educational practitioners and policymakers. By identifying the factors that influence technology adoption, educators can make informed decisions regarding technology integration, instructional design, and professional development initiatives. Additionally, educational institutions can utilize TAM to assess and enhance the usability and effectiveness of their technological infrastructures.

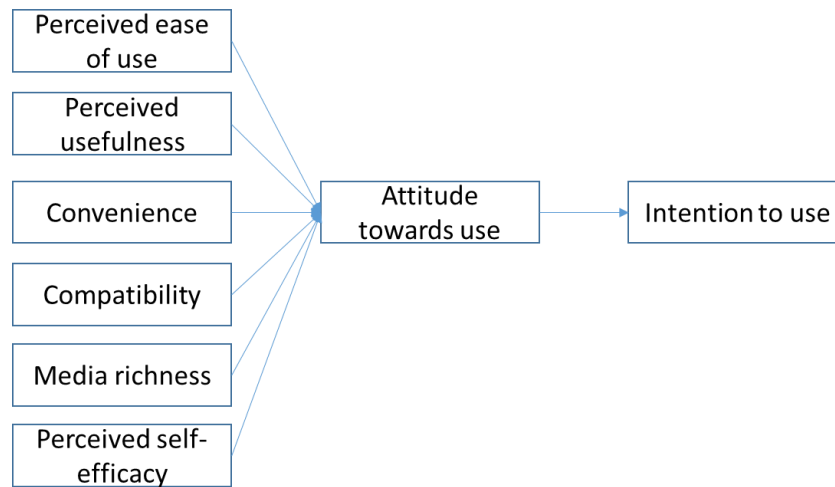
Despite its usefulness, TAM is not without limitations. The model primarily focuses on individual perceptions and may not fully capture the broader contextual factors that influence technology adoption in educational settings. Furthermore, the model assumes a linear relationship between perceived usefulness, ease of use, attitude, and intention to use, which may not always hold true in complex educational environments.

In conclusion, the application of TAM in education has significantly contributed to our understanding of technology acceptance and adoption in educational settings. It has provided a theoretical framework to examine the factors influencing technology use, offering valuable insights for educators, researchers, and policymakers to enhance the integration of technology in teaching and learning processes.

The main objective in this study is to examine the perception and acceptance of technological devices in the context of e-learning among students. The study aims to understand students' perspectives regarding the ease of use, usefulness, convenience, compatibility, media richness, perceived self-efficacy, attitude, and intention to use these devices. Additionally, the study seeks to identify areas for improvement and provide insights to enhance the design and implementation of e-learning initiatives based on students' needs and preferences.

The extended Technology Acceptance Model (TAM) is employed in this study to assess students' intention to use technological devices in the context of the pandemic. In addition to the core TAM constructs, this study incorporates several additional variables, namely convenience, compatibility,

media richness, and perceived self-efficacy. These variables are integrated into the theoretical framework depicted in Figure 1.



**Fig. 1.** Research theoretical framework

## 2.2 Instrument Measurement

Table 1 shows the measurement of each variable that will be used in this study. As described in the previous section, this study has 8 main variables.

**Table 1**  
 Variables explanation and measurement

Variable name	Description	Code	Item
Perceived ease of use	As the degree to which the prospective user expects the target system to be free of effort [13].	PEOU1	Using my device made e-learning simple during pandemic.
		PEOU2	Using my device made e-learning easy during pandemic.
		PEOU3	It is easy to be familiarized with the use of e-learning via my device during pandemic.
Perceived usefulness	As the prospective user's subjective probability that his/her job performance within an organizational context would be increased as a result of using a specific application system [13].	PU1	Using my device to access e-learning can increase the efficiency of my study during pandemic.
		PU2	Using my device to access e-learning can provide me useful information in my study during pandemic.
		PU3	My device allows me to get various information from my e-learning during pandemic.
Convenience	Consumers' time and effort perceptions in relation to using a service [21]	CON1	Using my device to access e-learning enables me to study without any constraints during pandemic.
		CON2	Using my device to access e-learning enables me to download information/content quickly during pandemic.

		CON3	Using my device saves my effort in study through e-learning during pandemic
		CON4	Using my device to access e-learning enables me to read information/content quickly during pandemic.
Compatibility	Compatibility can be defined as the degree to which an innovation is perceived as being consistent with the existing values, demands, and past experiences of potential users [22].	COM1	Using e-learning via my device suits my study style during pandemic.
		COM2	Using e-learning via my device is completely compatible with my current way of study during pandemic.
		COM3	Using e-learning via my device satisfies my current needs in study during pandemic.
Media richness	As the ability to convey information and enable users to communicate and exchange understanding (Daft & Lengel, 1984). In other words, media richness is the ability of a communication medium to reproduce the information sent over it [23].	MR1	In learning, my device enables me to get reliable information/content during pandemic.
		MR2	In learning, my device provides diverse types of information/content such as voice and image during pandemic.
		MR3	In learning, my device enables me to choose information/content depending on demand during pandemic.
Perceived self-efficacy	Is a person's particular set of beliefs that determine how well one can execute a plan of action in prospective situations [24].	PSE1	I am confident about using e-learning via my device during pandemic.
		PSE2	Using e-learning via my device would not be a challenge for me during pandemic.
		PSE3	I would feel comfortable to join e-learning via my device during pandemic.
Attitude	As the individual's positive or negative feelings about performing a behaviour [13].	ATT1	I would like to use e-learning via my device during pandemic.
		ATT2	Using e-learning via my device would be a pleasant experience during pandemic.
		ATT3	Using e-learning via my device would be a wise idea during pandemic.
Intention to use	Reflects the extent to which a person purposes to purchase particular products or Services [25].	INT1	I plan to use e-learning if I have easy access via my device during pandemic.
		INT2	I predict I would access e-learning via my device for my study during pandemic.
		INT3	I intend to access e-learning via my device for my study during pandemic.

### **3. Methodology**

The research commenced by making a request to the Academic Affair Department for a letter to obtain the actual student population data for all programs in session A192. At UUM (Universiti Utara Malaysia), session A192 refers to the first session held during the pandemic, where online teaching was implemented. The student population for session A192 comprised a total of 18,000 students across 45 programs at UUM. Referring to the table, the initial sample of respondents consisted of 377 individuals [25]. However, the researchers ultimately received 324 responses.

For this study, a questionnaire was developed and administered, consisting of two sections: Part A focused on the perception of technological devices, while Part B collected respondent demographics. The questionnaire was adapted and modified from previous studies [22,26,27]. It employed a Likert scale with five response options (strongly disagree, disagree, neutral, agree, and strongly agree) to assess the impact of technological devices on the acceptance of e-learning among students.

### **4. Research Findings**

The findings of this study show that 70% of the respondents are female and the rest are male (30%). A descriptive analysis was conducted on the students' feedback. Table 2 summarizes the results of the descriptive statistical analysis. The 5-likert scale has been aggregated into three groups: unacceptable (combining the 1st and 2nd scale points), neutral (3rd scale point), and acceptable (combining the 4th and 5th scale points).

Across the three codes (PEOU1, PEOU2, PEOU3), in Perceived Ease of Use, the majority of respondents expressed an acceptable perception of ease of use, with percentages ranging from 84% to 84.6%. The percentages of unacceptable responses were relatively low, ranging from 2.4% to 3.1%. These findings suggest that most participants found the technological devices used in e-learning to be user-friendly. Secondly, perceived usefulness (PU1, PU2, PU3) indicates that a significant proportion of respondents perceived the technological devices as useful, with acceptable response percentages ranging from 74.7% to 86.7%. The percentages of negative and unacceptable responses were relatively low, suggesting a generally positive perception of usefulness among the participants. For the aspect Convenience (CON1, CON2, CON3, CON4) received relatively lower percentages of acceptable responses compared to ease of use and perceived usefulness, ranging from 70.4% to 82.7%. However, the unacceptable response percentages were also relatively low, indicating that most respondents still found the e-learning environment convenient despite some variations in perception. The data on Compatibility (COM1, COM2, COM3) shows that a significant proportion of respondents perceived the technological devices as compatible with their e-learning needs, with acceptable response percentages ranging from 75.3% to 78.7%. The percentages of neutral and unacceptable responses were relatively low, suggesting a favourable perception of compatibility.

The media richness variables (MR1, MR2, MR3) indicate that the majority of respondents perceived the media used in e-learning as effective in conveying information, with acceptable response percentages ranging from 81.2% to 85.2%. The percentages of unacceptable and neutral responses were relatively low, indicating a generally positive perception of media richness.

The data on perceived self-efficacy (PSE1, PSE2, PSE3) suggests that respondents expressed relatively high levels of confidence in their ability to utilize technological devices for e-learning purposes. The percentages of neutral responses were generally low, while the percentages of unacceptable responses varied. Next, the attitude variables (ATT1, ATT2, ATT3) indicate a predominantly positive attitude towards the use of technological devices in e-learning, with

acceptable response percentages ranging from 80.9% to 82.4%. The percentages of neutral and unacceptable responses were relatively low. For intention to use (INT1, INT2, INT3) suggests a strong intention among respondents to continue using technological devices for e-learning purposes. The percentages of neutral and unacceptable responses were generally low, while the percentages of acceptable responses were high, ranging from 82.4% to 86.8%.

Overall, the findings indicate a positive perception and acceptance of technological devices for e-learning purposes. Respondents generally found the devices easy to use, useful, and compatible, with positive attitudes, intentions to use, and perceived self-efficacy. However, there were some variations in perceptions, particularly in convenience, indicating areas where improvements or adjustments may be necessary to enhance the e-learning experience.

**Table 2**  
 Descriptive statistics (N=324)

Variable	Code	U (%)	N (%)	A (%)
Perceived ease of use	PEOU1	3.1	13	84
	PEOU2	2.4	13	84.6
	PEOU3	3.1	12.3	84.5
Perceived usefulness	PU1	4.9	20.4	74.7
	PU2	2.8	12.3	84.9
	PU3	2.2	11.1	86.7
Convenience	CON1	7.5	22.2	70.4
	CON2	3.4	12	84.6
	CON3	4.7	17.3	78
	CON4	3.8	13.6	82.7
Compatibility	COM1	4.9	19.8	75.3
	COM2	3.7	17.6	78.7
	COM3	4.9	17.9	77.1
Media richness	MR1	2.4	14.5	83
	MR2	3	11.7	85.2
	MR3	2.1	16.7	81.2
Perceived self-efficacy	PSE1	3.4	15.7	80.9
	PSE2	9.6	27.8	62.7
	PSE3	3.1	16.4	80.6
Attitude	ATT1	2.4	15.1	82.4
	ATT2	3.1	15.7	81.2
	ATT3	1.5	17.6	80.9
Intention to use	INT1	1.8	15.7	82.4
	INT2	1.5	13.3	85.2
	INT3	1.5	11.7	86.8

## 5. Conclusions

In conclusion, this study examined the perception and acceptance of technological devices in the context of e-learning among students. The findings shed light on students' perspectives regarding the ease of use, usefulness, convenience, compatibility, media richness, perceived self-efficacy, attitude, and intention to use these devices. Overall, the results indicate a positive perception and acceptance of technological devices among the participants.

The data revealed that students generally found the technological devices easy to use, recognizing their usefulness in supporting their learning experiences. Additionally, students expressed confidence in their ability to utilize these devices effectively, highlighting their perceived self-efficacy. The high levels of intention to use the devices for future e-learning activities indicate a strong inclination among students to continue integrating them into their educational journeys.

However, the study also identified areas for improvement. The convenience variable received slightly lower positive response percentages compared to other variables, suggesting the need to address convenience-related concerns and enhance the overall accessibility and usability of the technological devices in e-learning environments.

The research contributes to the existing body of knowledge by providing valuable insights into students' perceptions and acceptance of technological devices in e-learning. These insights can inform the design and implementation of e-learning initiatives, ensuring they align with students' needs and preferences. Additionally, policymakers and educational institutions can utilize the findings to make informed decisions regarding the integration of technological devices in educational settings.

For future research, it is recommended to conduct qualitative investigations to gain deeper insights into students' experiences and preferences. Longitudinal studies can track changes in perception over time, while comparative studies can explore variations across demographic groups. Further research can also investigate the impact of students' perceptions and acceptance of technological devices on their learning outcomes, as well as explore emerging technologies in e-learning.

By understanding students' perceptions and acceptance of technological devices in e-learning, educational institutions can enhance the quality and effectiveness of online education, ultimately providing a more engaging and enriching learning experience for students [28].

### Acknowledgement

This research was funded by Universiti Utara Malaysia through Collaboration 1+3 Grant Scheme, SO Code:14939.

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