Students' acceptance of learning management system: Analysis of responses based on generational differences

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A B S T R A C T

The dynamic improvement of technology has led the world to move at lightning speed, affecting aspects of human life, including education. The Learning Management System (LMS) is one of the crucial technologies nowadays, especially during and post-COVID-19. Prior studies have explored this subject, including seeing the user's responses. However, little of the study could have a vast range with various background users as most education institutions are unlikely to have students from too heterogeneous backgrounds, especially age. Thus, this study aims to see how people from different generations, namely Generation X, Millennials, and Generation Z, respond to the LMS application. The study took place at Universitas Terbuka, one of the universities that implemented distance learning in their learning process. The 23-question adapted from the Technology Acceptance Model of Davis was designed and sent to students of Universitas Terbuka using Google Forms. Two main aspects of technology acceptance, behavior, and technology usefulness were the focus. Kendall's Tau formula was utilized to analyze the obtained survey data. The findings show that all generations respond well to technology: Generation X (2,04/2,15), Millenials (1,90/1,94), and Generation Z (2,07/2,17). The further analysis explained that there was no correlation between age and technology acceptance for behavior towards technology (0,964) and usefulness (0,886). The research result is believed to help educators and stakeholders maximize the use of technology in education. It also brings a broader point of view regarding the issues by serving as the basis and reference for E-learning studies. This research is considered to be beneficial for those focusing on integrating technology into distance learning.

INTRODUCTION

Education is and will always be inseparable from our civilization. As education relates strongly to the increase of knowledge, information, acquiring skills, and applicable methods in understanding and interpreting reality (Ennouamani & Mahani, 2018), educators and stakeholders must find the best and most suitable methods to achieve education's purpose. The change in society is at a dynamic pace. The improvement of technology and society's demands is on a whole different level. However, those could be an enormous opportunity for the world of education. As a result, it changed how education works, including the rise of electronic learning, known as E-learning.

E-learning relates heavily to integrating ICT (Information and Communication Technology) applications into teaching and learning (Wu et al., 2018). E-learning with the combination of technology and the internet then offers numerous benefits, including various formats of learning, the flexibility of place and time, and interactive learning that involves not only knowledge delivering but also giving feedback (Arkorful & Abaidoo, 2015; Ennouamani & Mahani, 2018; Rahmat et al., 2019; Saeheng, 2017). With various benefits offered, E-learning comes with names, such as web-based, online, distributed, computer-assisted, or internet-based learning (Harsasi, 2015). That terminology reflects the ability of E-learning to shape the standard concept of learning and the classroom.

The rapid technological changes, significantly since the beginning of the 21st century, have truly changed society. E-learning, strengthened with the internet and smartphones, is not only a complementary aspect of learning but, in some cases, plays one of the most vital roles. Its role has become more noticeable during the COVID-19 pandemic. Despite the pandemic being over, those in the educational field realize what technology or E-learning could offer. Therefore, the changes in the traditional education system are inevitable.

The waves of changes boosted by more accessible access to technology and social development affected numerous countries and educational institutions. Indonesia's education system also uses technology to improve the quality of education, especially higher education. Even though in Indonesia, the use of technology is still dominated by entertainment and communication purposes (Sugiarti & Kumaladewi, 2017), the proportion of technology in education is getting bigger by the day. The idea of covering and providing a type of education that is accessible, effective, and efficient has become the fuel for the integration of technology. This can be seen from the number of educational institutions that applied technology in their learning process. One of the leading institutions is Universitas Terbuka (Open University).

Universitas Terbuka is a state university that has long been assigned as an educational institution that could implement distance learning in Indonesia. At the higher education level, UT is believed to be the most experienced educational institution for implementing distance learning. The university consistently follows technology development, including E-learning, in this task. Therefore, E-learning has become an inseparable part of UT's vision, mission, and purpose (Rahmat et al., 2019; Universitas Terbuka, 2015). In 2002, Universitas Terbuka implemented E-learning to support its distance learning, and in 2013, it fully implemented E-learning for all classes and courses (Puspitasari & Listyarini, 2018).

Universitas Terbuka (UT) not only creates a learning atmosphere that is E-learning-based but is also characterized by diversity. The university has quite a broad range of students' ages. Start from early 20s to late 40s. Using the generation classification, the students consist of Gen X, Millennials, and Gen Z (Becton et al., 2014; Turner & Turner, 2018). This condition is rarely found in other universities, especially state universities, where students are commonly homogenous in terms of age.

Interestingly, with a unique learning system and relatively uncommon characteristics, UT successfully attracts students from various places. There are tens of thousands of students from various regions in Indonesia. Uniquely, it is highly possible that the students would never actually meet face-to-face, not only their classmates but also their lecturers. These, for some points, are beneficial in terms of coverage. However, it does not mean it comes without cost.

Even though e-learning systems offer numerous benefits, they still have flaws and problems. Pegler (1992) stated that the computerized system in education institutions requires a balance between professional human resources and technological advancement. Distance between education staff, lecturers, and students should not be the reason for creating a demotivation situation. The other problem is answering the question of whether all the people can operate the system properly. Ideally, limited time in the learning process should not be spent learning how to use the required technology or application.

As an online-based university, UT must also overcome the obstacles related to its E-learning process. As mentioned, UT has students from various backgrounds, including age gap from several generations. Research shows that age, specifically generational identity, relates to and is characterized by the aspect of technology mastery (Rodriguez et al., 2003). For example, Generation Z and Millennials are believed to be the two generations that differ from previous generations in using new technologies. Millennials are considered the first digital natives (Glass, 2007). This is because they grew up with technology. Just like Millennials, generation Z has also been in touch with technology since an early age (Syafri, 2019). This dimension then raises a question: could technology be accepted differently?

Education systems have known "learning in class" as a spatial set of traditional conditions. However, the concept offered by UT is not unacceptable. It is responded to positively by people, especially those needing standardized education that could be accessed even in rural areas. Things to be highlighted are that the shift from in-person learning, as experienced by UT's students in their previous schools, to fully online learning requires changes in interaction behavior. Adjustment to deal with technology is unavoidable (Sulisworo et al., 2020). However, any form of classroom and learning process conceptually has the same educational purposes.

Like the traditional learning process, E-learning also requires the comfort of the people using it. Sense of discomfort and insecurity in the learning process will result in a longer adaptation process to technology and online learning platforms (Geng et al., 2019). All related variables must be ready to develop a coherent and achievable E-learning strategy, including students, lecturers, technology, and the environment (Mosa et al., 2016). The basic principle of E-learning, including distance learning, should be similar to the conventional learning process. These aspects also become the considerations of UT, as the leading distance learning institution in the country.

The E-learning classes of Universitas Terbuka (UT) cover almost all the necessary aspects for learning. Both students and teachers can access numerous facilities in the E-learning classes, including attendance lists, material, discussion forums, quizzes, homework, and even learning evaluations (TERBUKA, 2022). Not only focusing on the online learning process, the university also provides students with various facilities, including a digital library, virtual reading rooms, open learning resources, UT digital learning materials, and online community forums. All are accessible online (Puspitasari & Listyarini, 2018). All those to ensure the acceptability of the learning and to achieve the aims of the teaching.

Universitas Terbuka (UT), where students have heterogeneous characteristics, offers a unique condition for its E-learning process. With the learning process that provides the E-learning concept, the heterogeneous characteristics, and the extensive generational range of students, UT has become a valuable research object in the pedagogic and technology discipline.

Research that explores phenomena to define people by age range is gaining popularity (Dolot, 2018). Numerous research studies use age as a variable in e-learning.

Al-Adwan and the team (2018) researched on Jordanian students. They explored factors influencing the students' intention to use m-learning, including relative advantage, complexity, social influence, perceived enjoyment, facilitating conditions, and self-management. They also examine moderating effects: age, gender, and course type. With the Behavioural Intention of using M-learning (BEI) as the dependent variable, the research found that Relative Advantage, Complexity, Facilitating Condition, Perceived Enjoyment, and Self-Influence positively

affect BEI. However, they found only course types that affect complexity and facilitating conditions. The other two moderating variables, age and gender, have no significance towards the independent variables.

The other research by Binyamin and team (2020). They examined the acceptance of higher education students toward LMS (Learning Management System). The study was conducted in Saudi Arabia and highlighted two moderating variables: gender and age. The research revealed that gender moderates the relationship between content quality and perceived ease of use. However, age has no moderating influence on the students' use of LMS—the findings of two previous studies also agreed with the research of Kerzic et al. (2021). University teachers' age is not a factor that affects ICT use. This finding was found from 401 teachers at Ljublana University, Slovenia. Though the researchers highlighted differences in how university teachers use technology, younger teachers use ICT for social and entertainment purposes significantly more often than their older counterparts.

Compared with previous research, Rojas-Mendez and team explored the adoption and use of technology-based products and services with demographics and attitudinal. The research was conducted in two countries, USA and Chile. The study used the three most common demographic variables: age, gender, and education. The result found that age is significantly related to the technology readiness dimensions in both countries. In addition, younger respondents scored higher on innovativeness and optimism and lower on discomfort and insecurity than their older counterparts (Rojas-Méndez et al., 2017).

Numerous research studies have tried to explore the age factors with ICT use in learning environments, which is still a crucial topic. However, research challenges focus on age as the research's object. One of the obstacles is the sample's condition, which is common in homogenous situations. The Educational environment, teachers and students, is mostly in the already standardized condition.

Standardized conditions create some limitations in terms of searching for more heterogenic responses. Regarding the age differences, the object's limitation is not entirely various or most likely still at the same generation. This creates factors that are hard to explore, such as the generational gap. Additionally, it could lead to bias in having a conclusion. If the students come from relatively same age or generation, there is a high probability that they will know and see technology similarly. A bigger perspective is necessary, especially when different generations are believed to have faced different circumstances and conditions with technology development.

To address the above-mentioned research gap in scientific literature and contribute a more comprehensive description regarding the development of technology in education, the current study aims to find out the responses to teaching and learning technology among different generations, namely Generation X, Millennials, and Generation X.

A verified and well-known instrument is necessary to ensure the research findings are valid, reliable, and standardized. The Technology Acceptance Model (TAM), which Davis developed, became the backbone of this research. TAM is the key model and one of the most popular ways to predict human behavior toward acceptance of technology. It is also widely used by researchers in this discipline (Ahmed & Saidu, 2022; Binyamin et al., 2020; Granić & Marangunić, 2019; Herlambang et al., 2018; Huang et al.,. Therefore, it is believed that this research could deliver a clearer picture of people's behavior toward technology.

Focusing on students in Universitas Terbuka (UT) who come from a heterogenous background, this research unveils responses from various generations ranging from Generation X to Generation Z. To our knowledge, this research offers novelty in the field of this topic. Most of the studies that put age as a variable cannot provide a broad range of age gaps due to the common characteristic of classes that require students' age to be in a limited range.

METHOD OF THE RESEARCH

Participants

This quantitative research aims to see the effect of generational differences on learning technology. E-learning of Universitas Terbuka became the learning application that was focused on. The participants of this survey are the students of Universitas Terbuka. The sampling technique used in this research is probability random sampling, in which all participants have the same opportunity. The total number of participants in the research is 100 students. The research participants are those who have used the LMS, Learning Management System, for 1-3 years. The questionnaire, using Google Forms, was sent through the WhatsApp group of the students.

The participants were from various backgrounds. The condition aligns with the assumption of UT students' heterogeneous backgrounds. To have a clearer view, table 1 explains the participants' demographic.

Table 1. The Profile of Participants

	Characteristics	Percent
Gender	Male	24%
	Female	76%
Age (Generation Based)	Generation X (40-55)	17%
	Millennial (24-39)	48%
	Generation Z (Under 24)	35%

Instruments

The survey was anonymous. The participants were asked 23 questions, 20 in the Likert-scale form, ranging from 1 (strongly agree) to 5 (strongly disagree), and three questions in yes/no questions. The questions were adapted from the Technology Acceptance Model developed by Davis (1989). This model is the key model and also one of the most popular ways to predict human behavior toward technology acceptance (Ahmed & Saidu, 2022; Binyamin et al., 2020; Granić & Marangunić, 2019; Herlambang et al., 2018; Huang et al. 2021; Lin & Tsai, 2021). This model is developed based on two essential beliefs: usefulness and behavior. Those beliefs become the basic foundation that is explored in this research.

Data Analysis

Based on the concept of the Technology Acceptance Model developed by Davis, this research explores age (X_1), behavior towards (Y_1), and usefulness (Y_2) of the E-learning application of UT. However, in this research, age as the primary independent variable is classified into the generational categories, namely Generation X, Millennial, and Generation Z, instead of numbers.

To analyze the relationship between variables, the researchers use Kendall Tau's analysis. To examine the effect of age in terms of generation category on relations with the behavior towards technology and technology's usefulness, the following hypothesizes are proposed:

H_{1a}: Age affects students' behavior toward technology
H_{0a}: Age does not affect students' behavior toward technology
H_{1b}: Age affects students' perception regarding technology usefulness
H_{0b}: Age does not affect students' perception regarding technology usefulness
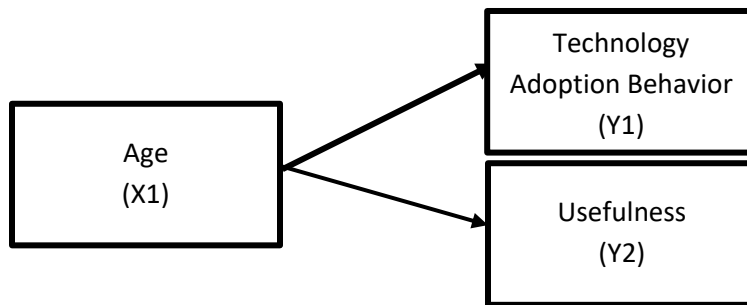
Figure 1. The Conceptual Model

RESULTS

Technology Acceptance Model Analysis

The data indicates that UT's students come from various backgrounds, with most working in education and having already interacted with E-learning in their workplace.

The participants' responses regarding the UT's LMS were also analyzed. The statistical range indicates quite a similar range for all generations. The summary is provided in Table 2.

Table 2. Total Score of TAM (Technology Acceptance Model)

	Minimum	Maximum	Mean
Generation Z	1.00	4.74	2.13
Millennials	1.00	4.87	1.92
Generation X	1.00	3.26	2.10

The results show that the highest score comes from the youngest generation, Generation Z (those under 24), with 2,13. In comparison, the lowest score comes from the Millennials (24-39), with 1,92. The result shows that Millenials tend to accept technology better than the other two in terms of technology acceptance, which is the UT's Learning Management System.

In more detail results, the test also statistically counts into two main indicators: Technology adoption Behavior (Y_1) and Technology Usefulness (Y_2). The following tables, Table 3 and Table 4, explain the respondents' responses.

Table 3. The score of Behavior towards Technology

	Minimum	Maximum	Mean
Generation Z	1.00	4.67	2.07
Millennials	1.00	5.00	1.90
Generation X	1.00	3.33	2.04

Table 4. The score of Technology Usefulness

	Minimum	Maximum	Mean
Generation Z	1.00	4.79	2.17
Millennials	1.00	4.79	1.94
Generation X	1.00	3.21	2.15

The results show that Generation Z has a higher mean score for behaviors (2,07) and usefulness (2,15). It is then respectfully followed by Gen X and Millenials. From the statistics, millennials are considered to have better behavior toward technology (1,90) and its usefulness (1,94). However, the gap between those three generations is considerably thin, with the margin between Millenials and Z is only less than 0,25.

The data above could first give the bigger picture regarding the relationship between age (generational differences) and the responses towards technology. However, the second step for statistical calculations is necessary to answer the research questions. In this step, the data's normality is checked using Kolomogorov-Smirnov, as explained in the following table, to decide what statistical formula to use.

Table 5. Test of Normality

	Kolmogorov-Smirnov[a]		
	Statistic	df	Sig.
Behavior	.125	100	.001
Usefulness	.134	100	.000

The result of the normality test shows that both Behavior (Y_1) and Usefulness (Y_2) are not normally distributed with significance less than 0,05; behavior (0,001) and usefulness (0,000). From this result, it can be concluded that the formula used should be for non-parametric data. Therefore, for this case, the researchers use the Kendall Tau formula, which is considered more accurate than others (Huck, 2012).

Kendall Tau Analysis

The statistical analysis for the first aspect, age and behavior toward technology, is as follows:

Table 6. Statistical Analysis of Relation between Age and Behavior

			Behavior
Kendall's tau_b	Age	Correlation Coefficient	-.004
		Sig. (2-tailed)	.964

The statistical analysis of the variable age and behavior using Kendall's Tau formula shows that the significance is 0,964 or higher than 0,05. It means that age does not affect people's behavior toward technology. In this case, it can be said that despite the generational differences between the students, they have relatively the same behavior toward technology.

The second data analysis aims to reveal the effect of age on the perception of technology's usefulness. Similar to the previous data analysis, the Kendall's Tau formula is used. The results found as follows:

Table 7. Statistical Analysis of Relation between Age and Technology's Usefulness

			Usefulness
Kendall's tau_b	Age	Correlation Coefficient	-.011
		Sig. (2-tailed)	.886

The statistical analysis of the variable age and perception of technology's usefulness using Kendall's Tau formula shows that the significance is 0,886 or higher than 0,05. It means that age has no effect on people's perception of technology's usefulness. The result concluded that all generations, Gen X, Millennials, and Gen Z, have the same responses regarding the usefulness of UT's E-learning.

The data analysis using Kendall Tau's formula proves that hypotheses H1a and H1b are rejected. In other words, generational differences or age shows no differences in accepting the technology regarding behavior and usefulness.

DISCUSSION

The research aimed to determine how people from different generations responded to the technology for educational purposes. By exploring respondents from three different generations, namely Generation X (40-55 years old), Generation Millennial (24-39 years old), and Generation Z (under 24 years old), this research tried to explore aspects that are rarely found in current education systems.

The research findings show no correlation between age, despite their generation, and people's responses toward technology. All three generations have similar responses toward technology. Statistical findings elaborate that the gap between the responses is relatively small, less than 0,25 for both aspects of technology acceptance. Kendall's Tau analysis then strengthens the hypothesis that there is no correlation between the variables.

This study's findings align with Binyamin's (2020) and Kerzic's (2021) research. Both studies elaborate that age does not affect how students or teachers respond to technology. Binyamin's study is considered the most similar to this current research in terms of focusing on the learning application, LMS (Learning Management System), and the instrument's foundation, TAM (Technology Acceptance Model). However, the differences are highlighted in the previous research, which was unable to explore the more extensive range of age, in which they only conducted research with respondents from similar demographic backgrounds. Despite having different characteristics from Kerzic's research, in which the study did not limit the type of technology, it did not erase the concept that older teachers also find technology no more of an obstacle to their learning process.

Strengthening two previous findings is the research of Al-Adwan et al. (2018), in which they found no visible correlation between age and Behavioural Intention of using M-Learning (BEI). This research could lead to an understanding that mobile learning is not an alien technology to use in Education.

To conclude, current research's findings also strengthen the idea that people nowadays most likely find few or few obstacles to adapting to technology, especially in education. Even though generation stereotypes exist, the technology is still widely and easily used.

Even though numerous research studies and the current research found no correlation between age and how people respond to technology applications, there are still research studies that provide different facts. For example, the research of Morris and Venkatesh (2000) and Rojas-Mendez et al. (2017) proved that age affects people's responses toward technology. Therefore, these findings become interesting points to explore and compare, specifically how to find and read bigger pictures of age and technology.

Morris and Venkatesh's research could become a hint at how rapidly technology has expanded. However, the fact that their research is considered as not up-to-date research and not an E-learning research as it was conducted in the late 90s and in an accounting firm, does not erase the fact that it picturized society's responses towards technology. Morris and Venkatesh also highlighted their findings by stating that older people tend to have less basic knowledge regarding technology, resulting in anxiety about technology or training for technology in general.

Following Morris and Venkatesh's research is the research of Rojas-Mendez and the team. Relatively a new research, they conducted their research in two countries: the USA and Chile. Their research found that younger people have better innovativeness and optimism than their older counterparts. They also have lower discomfort and insecurity towards technology. Like Morris and Venkatesh, they also did not explore technology for education.

The two previous research findings become intriguing to be connected to the current research. Those refer to the fact that this research unveils that age does not correlate with responses toward technology.

Seeing the research findings of this current research and how it contradicts the last two research could lead to a conclusion about how age works in people's response to technology. Several assumptions could be made to have a more proper understanding. As mentioned before, this research and numerous research have found that age does not correlate with technology acceptance. However, several points should be noted. In terms of technology for education, there is a high chance that most people, teachers, students, education staff, and others are using technology more often than ordinary people. The aspects of frequent interactions are a must, especially during the classes or learning program.

This study finds that despite coming from different generations and backgrounds, participants still have good responses to UT's learning system. Factors such as exposure to technology or long-time practices help them reduce or minimize the problems they commonly face. In addition, most students have interacted with the technology since the first meeting and already know how UT runs its classes. This is highly related to the fact that although the students come from older generations, most are already working in education and using technology in their learning process.
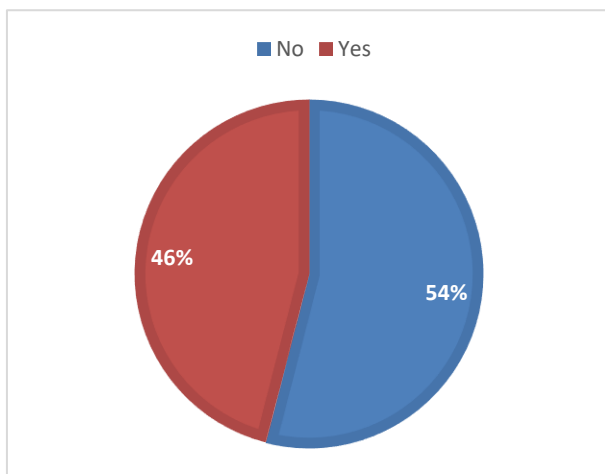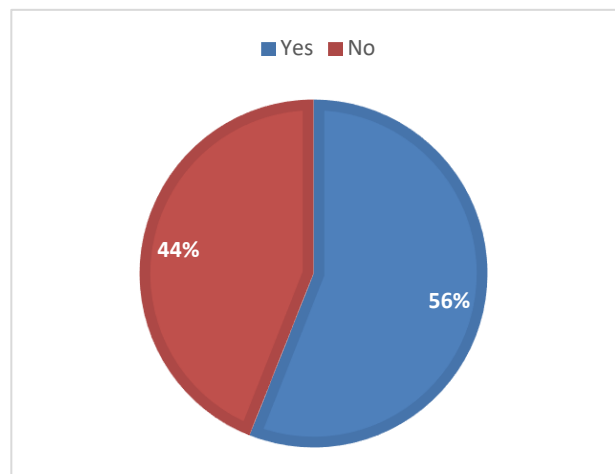

Figure 2. ICT Usage in Working Place

Figure 3. Having Education-Related Job

The fact that the correlation between the two variables, age and technology acceptance, is likely debatable opens the door for a broad chance for further research. The current research brings a new additional fact that technology is accepted by a more extensive scope of people in the educational field. The generational gap is relatively small, especially for Generation X to Generation Z, as elaborated in the research findings.

Despite all the conditions, there are still some points that this research cannot cover. First, the conditions of the participants' prior knowledge or pieces of training regarding the application use. These aspects are believed to have contributed to students' ability and responses to the technology used in Universitas Terbuka. The second is the regulation and circumstances that push the students to use and understand the technology, despite age. The last is the coverage of this research, which is still small and limited, focusing only on one university.

Therefore, based on this research's obstacles and challenges, further research must elaborate on and explore people's responses towards technology, especially in education. A latest and more comprehensive model of measurement could be developed.

However, despite the aspects that could not be explored more by this research, we hope this research can provide and contribute to a better understanding of E-learning. Furthermore, this research provides evidence of demographic characteristics and technology relations.

CONCLUSION AND RECOMMENDATIONS

To answer the questions in the introduction, this study used Davis' Technology Acceptance Model (TAM) and extended it by focusing on the moderating effect of age based on generational differences. The study focuses on how people from different generations responded to technology, specifically the Learning Management System (LMS) of Universitas Terbuka. The university is considered one of the most sophisticated educational institutions and has students from various generations.

This research examined the effect of age on two dominant aspects of technology acceptance: behavior toward technology and usefulness. This led to the conclusion that age, despite the generation background, has no significant effect on someone accepting technology (LMS) in Universitas Terbuka. Therefore, we suggest that policy and advancement of technology could be boosted as students find it is not an alien technology anymore and have positive views regarding using technology for education.

This study is not without limitations, and several points are worthy of consideration. First, the targeted students of this study are assumed to have been working with technology several times and are likely to have received training before. This could be seen from the participants' background, in which most of them work in the educational field and already have technology-supported facilities in their workplace. The next aspect is that the Universitas Terbuka's characteristics have made technology inseparable. Long-time interaction and regulation regarding the use of technology are believed to be one of the aspects that influence students' responses to technology. Despite it being a good thing, general implementation is considered more challenging. Regular university or school students probably result differently. The last aspect is the coverage of this study, as it was only conducted in Universitas Terbuka and focused on one type of learning technology (UT's LMS).

This study is believed to bring new findings and views in this field. However, the limitations of this study could be considered for further research. E-learning is a vital open world that still needs to be explored.

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