

Technology adoption on online learning during Covid-19 pandemic: implementation of technology acceptance model (TAM)

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Abstract

Individual behavior in technology adoption can be predicted by perception and belief. Implementing TAM, this study aims to analyze the behavioral teaching staff in using Google Apps for online learning. This study examined the effect of perceived usefulness, perceived ease of use, and user training and support on behavioral intention to use technology. We analyzed 108 samples using SPSS Process Model 4 and Model 15 to examine the mediation effect and moderated mediation effect. Our results show that perceived usefulness is confirmed to mediate the perceived ease of use behavioral intention to use technology. However, moderated mediation effect is not supported. This study contributed to advance the empirical evidence on the implications of TAM in analyzing technology adoption.

Keywords

technology adoption; technology acceptance model; perceived usefulness; perceived ease of use; online learning

INTRODUCTION

Organizational changes come from external and internal. The change is stimulated by international competition, new information and communication technologies, investors, and revolution industry from external. Whereas downsizing, restructuring, merger, and acquisition can impact the operational changes in organizations. These changes can affect the attitudes and orientations of employees (Grunberg et al., 2008). In 2019, the Covid-19 pandemic has been a significant factor that affected changes in all sectors in the world. In Indonesia, it began in March 2020. The Indonesian government launched a policy to apply physical distancing to prevent the spreading of the disease.

One of the industries affected by the Covid-19 Pandemic is the educational industry, from primary school to higher education institutions. These institutions must change their operations, including learning activities from offline (classroom learning activities) to online. These changes require good adaptability from teaching staff, students, and administrative staff. It is not easy because not all higher institutions are ready for this change. However, higher education institutions are impactful because most of their students come from different

cities and maybe international ones. Also, online learning demands technology to support the activities (Chu & Robey, 2008).

Higher education institutions apply various applications to support their learning activities. One application that can be adopted is Google Apps, especially Google Application for Education. This application is used by many schools and universities worldwide to enhance teaching and learning (Awuah, 2015). It provides unique features that can be used in the learning process (Basri et al., 2019). The features can support teaching staff to deliver their knowledge and modify their learning design and method. For example, google classroom to organize class; then google docs, google sheet, google form, google slide, etc., to assign tasks and support collaborative learning; google meet also supports video conferences. Although Google Apps has many features to support online learning, how the teaching staff can adopt it is still unanswered. The questions are "Is Google Apps easy to use?" and "Is Google Apps useful in teaching activities in higher education during online learning?"

To answer these questions, we implemented Technology Acceptance Model (TAM) by Davis (1989). TAM introduces how to predict individual behavior in adopting technology from the perspective of ease of use and technology usability. Studies of

TAM have been conducted in different contexts. For example, communication company (Karahanna & Straub, 1999), Enterprise Resource Planning (ERP) (Ramayah & Lo, 2007), online course (Tung & Chang, 2008), computer (Fagan et al., 2008), E-Book adoption in an educational institution (Al-Suqri, 2014), mobile maps (Hussain et al., 2016), and SPSS (Kusumah, 2018). However, there are inconsistent results that need to study for future research. In addition, this study intends to capture how TAM can predict technology adoption by teaching staff. During Covid-19, teaching staff cannot avoid the changes even though they have limited capabilities to apply online learning. They must be able to apply the technology used by educational institutions (i.e., Google Apps). Therefore, it is interesting to study how teaching staff adopts the technology.

TAM proposed that behavioral intention to use technology is affected by perceived ease of use and perceived usefulness. Perceived ease of use defines the level of individual belief that technology is easy to apply or effortless. Meanwhile, perceived usefulness explains that technology can improve performance and support tasks (Davis, 1989).

TAM was developed into new approaches, including TAM2 (Venkatesh & Davis, 2000), UTAUT (Venkatesh et al., 2003), and TAM3 (Venkatesh & Bala, 2008) (see Lai, 2017). The difference between the three is the variables used in the research model. For example, TAM2 elaborates subjective norms, voluntariness, and image to TAM. All three are determinants of perceived usefulness (Venkatesh & Davis, 2000). Meanwhile, UTAUT from Venkatesh et al. (2003) examined performance expectancy, effort expectancy, social influence, and facilitating conditions on behavioral intention moderated by gender, age, experience, and voluntariness of use. Venkatesh et al. (2003) also tested the effect of behavioral intention to use behavior. On the other hand, TAM3 is a development from TAM2 where TAM3 adds a factor that determines perceived ease of use. This approach can present a comprehensive nomological network to determine technology adoption and use (Venkatesh & Bala, 2008).

Although these approaches are applicable to predict behavioral intention determinants to use technology, this study chose the primary Model–Final version of

TAM from Davis & Venkatesh (1996) that focuses on the effect of perceived usefulness and perceived ease of use on behavioral intention to use technology. This model is suitable to investigate the acceptable or unacceptable of a particular technology (see Lai, 2017).

Technology complexity often will be a barrier to adoption. Perceived of an individual can determine if he/she will use this technology or not. It is what has been captured by TAM. Perceived ease of use will encourage him/her to adopt or to use the technology. Then, perceived usefulness also drives individuals to use technology because he/she believes that technology will help him/her to complete the tasks. However, it becomes a question when people have to adopt technology because they have no other choice. This study tried to examine Google Apps because it has many features and familiar to society. These support people to solve their problems to switch from offline to online learning. Moreover, operations guidance is easy to find, such as internet sources. It will support users to get information on how to operate the application.

During the Covid-19 pandemic, the teaching staff is forced to apply online learning. In this case, some higher educational institutions decided to adopt a new technology to support learning activities. However, the availability of new technology does not mean easy to accepted by teaching staff. Therefore, training is needed to help them adopt new technology (Sugar et al., 2004). Keengwee et al. (2009) also emphasized that training and support are essential to determine the success or failure of new technology adoption in higher education institutions. A study by Hubbard (2013) also found that training will support the utilization of technology more effectively. According to previous studies, we assume user training and support can improve teaching staff perceptions, especially those considered perceived ease of use and perceived usefulness of Google Apps to help their online learning. Therefore, user training and support can be moderating the effect of perceived ease of use and perceived usefulness on behavioral intentions to use technology.

This study aims to predict the behavior of teaching staff in using Google Apps for online learning by TAM. This application has many features that can assist the teaching

staff in completing assignments and assist in teaching.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Behavioral theories

Individual behavior is figuring out by the intentions of individuals formed from the attitudes and beliefs. This concept is clearly explained in Theory Reasoned Action (TRA) by Fishbein dan Ajzen in 1975. In TRA, Fishbein dan Ajzen (1975) described that individuals' intention to behave is affected by subjective attitudes and norms that depend on individual belief (Davis et al., 1989; Ramdhani, 2016). Ajzen (1985) developed TRA to be the Theory of Planned Behavior (TPB). TPB illustrated that individual behavior depends on the intensity to behave (Doll & Ajzen, 1992). Behavioral intention is influenced by subjective attitudes and norms and the perception of behavioral control. This perception is determined by an individual's belief in resource control that refers to Bandura (1977) (Ajzen, 2002). Self-efficacy explains that an individual's belief in the resources affects his perception of what he/she is facing.

Referring to TRA, Davis et al. (1989) developed Technology Acceptance Model (TAM) to analyze individual behavior to adopt the technology. In his study, he observed the adoption of computers. TAM introduced two concepts to predict individual behavior in technology adoption. TAM points that perceived ease of use and perceived usefulness presume behavioral intention to use technology. Perceived ease of use is the degree of perception that a particular system (technology) does not require much effort (Davis, 1989). Individuals find that it is easy to use or not too complicated. If the individual perceives that it is easy to operate, he/she will use it. Besides, perceived usefulness illustrates that an individual believes that a system can help him/her solve problems and complete tasks. He/she also sees that the system will improve performance (Davis, 1989). If technology is deemed able to complete the tasks, it will be adopted.

Online learning

Technology is essential to support the online learning process (Chu & Robey, 2008). Online learning, well known as distance

learning, is interpreted as a learning method by utilizing technology as a medium to transfer knowledge without limitation of time and place. During online learning, the interaction between a teacher and students is essential (Ni, 2013). The teacher can design synchronous and asynchronous learning (Beldarrain, 2006; Dhawan, 2020). Synchronous learning is a learning process that interacts the teacher and students simultaneously, such as teleconference. In asynchronous learning, a learning process between the teacher and students can be conducted differently (Chen et al., 2005). Also, asynchronous support the teacher to utilize materials from open sources. However, it does not facilitate honest discussion (Beldarrain, 2006). Sharing materials and assignments are common in asynchronous. Two ways interaction is not supported.

The effect of perceived usefulness on behavioral intention to use

Individuals who perceive that technology is helpful for his/her job tends to use it. This concept has been developed in several studies of technology adoption. In adopting technology, Davis (1989) explained that the higher the degree of perceived usefulness, the higher the tendency to use the technology. Karahanna & Straub (1999) found that perceived usefulness positively impacts the intention to use email as communication media. Perceived usefulness will decrease ambiguous tasks and improve performance. So, when an individual perceives that ERP is valuable, he/she will use it (Ramayah & Lo, 2007).

Moreover, Suki & Suki (2011) claimed that perceived usefulness is a significant determinant of behavioral intention to use 3G mobile services. However, To et al. (2008) confirmed that perceived usefulness is not considered to adopt instant messaging (IM). Employees do not think that IM will increase their productivity. It is caused no distinction of IM for business and private conversation.

In education, Tung & Chang (2008) found that perceived usefulness positively affected behavioral intention to join online courses. Al-Suqri (2014) also added empirical evidence after examined on e-book applications in educational institutions. He found that students who perceive that e-book can help them to study will adopt e-book.

From some previous studies, this study assumed that when technology is in line with the user's job, perceived usefulness is still considered. This study predicted that perceived usefulness would encourage teachers to adopt Google Apps. On the pressure to apply online learning during the pandemic, a teacher who perceived that Google Apps can help his/her work and improves performance tends to utilize it. He/she believes that even though learning how to operate Google Apps in online learning, he/she will not be doubted. Based on the explanation above, it can be hypothesized.

H1: Perceived usefulness is positively related to behavioral intention to use

The effect of perceived ease of use on behavioral intention to use

Technology that is perceived as ease of use will be interesting for people. Perceived ease of use encouraged a person to apply the technology (Davis, 1989). Previous studies found that perceived ease of use is positively affected to behavioral intention to use. For example, Fagan et al. (2008), who researched utilizing a computer, and Ramayah & Lo (2007) in ERP found that employees who perceived technology as ease of use will tend to adopt the technology. Suki & Suki (2011) support them that perceived ease of use influences the behavioral intention to use 3G mobile services because they quickly adopt it.

In this study, teachers perceive that Google Apps is easy to use. So, they choose this application to help and support them in doing their job. Easy operating systems need less effort to understand how systems

work. Based on the argument, this research formulates the following hypothesis:

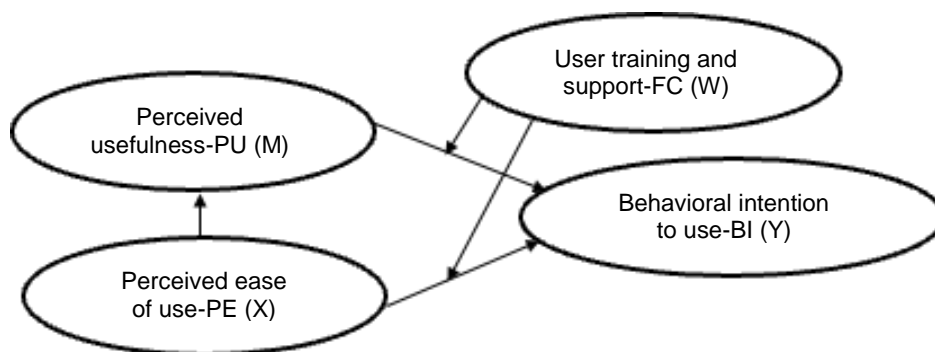
H2: Perceived ease of use is positively related to behavioral intention to use

Perceived usefulness mediates the effect of perceived ease of use on behavioral intention to use

When technology and system are easy to use, individuals tend to adopt. However, previous studies assumed perceived ease of use did not affect direct behavioral intention to use technology. Ramayah & Lo (2007) found that perceived usefulness was mediated the effect of perceived ease of use on behavioral intention to use technology. When, individual beliefs that technology is easy to use, he/she will see the usefulness of the technology. Then, he/she will decide to use it or not. Perceived ease of use was predicted as the antecedent of perceived usefulness (Kanchanatane et al., 2014; Kuo & Yen, 2009). Partial mediation of perceived usefulness on perceived ease of use and behavioral intention to use is predicated. However, Smith (2008) confirmed no significant effect of perceived ease of use on perceived usefulness. His study was conducted on the Web Site usability for e-commerce.

During online learning, teaching staff as instructors and designers of the learning process will assess whether the technology is easy to use or not. Ease of use technology can encourage teachers to try and assess whether the technology will improve performance or not. They do that because the experience in using technology contributes to their perception (Ramayah &

Figure 1.
Research model



Lo, 2007). Following these arguments, this study hypothesizes:

H3: Perceived usefulness mediates the effect of perceived ease of use on behavioral intention to use

User training and support moderates the effect of perceived usefulness and perceived ease of use on behavioral intention to use

User training and support can increase the use of technology (Thompson et al., 1991). It also builds individual awareness and

perception in applying the technology (Karahanna & Straub, 1999). During the Covid-19 pandemic, teaching staff who previously used traditional face-to-face learning methods should immediately convert them to online learning. In this case, teaching staff uses Google Apps to facilitate their online learning. User training and support to operate Google Apps are helpful in this process of change.

Training provided internally and externally at higher education can support teaching staff to apply Google Apps. For this reason, user training and support of Google Apps can strengthen the influence of the

Table 1.
Instrument testing

	AVE	Factor Loading				Cronbach's Alpha
		1	2	3	4	
I use (intend to use) Google Apps frequently in teaching. (B1)	0,769	0.242	0,769	-0.031	0.822	0,746
I use (intend to use) Google Apps whenever appropriate to do my job. (B2)		0.214	0.226	0.186	0.797	
Learning to operate Google Apps would be easy for me (PE1)	0,645	0.202	0,645	-0.127	0.081	0,840
I would find it easy to get Google Apps to do what I want it to do. (PE2)		0.506	0.474	0.284	0.212	
My interaction with Google Apps would be clear and understandable. (PE3)		0.322	0.656	0.072	0.244	
I would find Google Apps to be flexible to interact with. (PE4)		0.312	0.346	0.263	0.503	
It would be easy for me to become skillful at using Google Apps. (PE5)		0.142	0.788	0.172	0.076	
I would find Google Apps easy to use. (PE6)		0.021	0.770	0.106	0.399	
Using Google Apps in my job would enable me to accomplish tasks more quickly. (PU1)	0,687	0.583	0,687	0.113	0.234	0,899
Using Google Apps would improve my job performance. (PU2)		0.871	0.210	0.077	0.155	
Using Google Apps in my job would increase my productivity. (PU3)		0.783	0.237	0.073	-0.027	
Using Google Apps would enhance my effectiveness on the job. (PU4)		0.855	0.022	0.083	0.160	
Using Google Apps would make it easier to do my job. (PU5)		0.789	0.032	0.007	0.244	
I would find Google Apps useful in my job. (PU6)		0.788	0.184	0.132	0.152	
Guidance is available to me at using Google Apps. (FC1)	0,787	0.038	0,787	0.822	0.150	0,835
A specific person (or group) is available for assistance with Google Apps difficulties. (FC2)		0.158	-0.050	0.862	-0.013	
Specialized instruction concerning Google Apps is available to me. (FC3)		0.105	0.052	0.908	0.108	

perceived usefulness on the behavioral intention to use it. Based on this explanation, this study assumes that user training and support moderate the effect of the perceived usefulness on the behavioral intention to use technology. The hypothesis is formulated as follows.

H4a: User training and support moderates the effect of the perceived usefulness on the behavior intention to use

Besides, training can also provide experience for teaching staff on how to use technology. This experience is vital because it can increase the perception of an individual's ease of using technology (Ramayah & Lo, 2007). Jahangir & Begum (2007) also explained that training could help make it easier to operate technology. Therefore, user training and support can reinforce the influence of perceived ease of use on the behavioral intention to use Google Apps. For that, this study formulates the following hypothesis.

H4b: User training and support moderates the effect of the perceived ease of use on the behavior intention to use

METHODS

This study derived from the switching of learning methods from offline to online learning during the Covid-19 pandemic. A quantitative research model was designed to test individual behavior in adopting the technology. Implementing TAM, this study evaluated the impact of perceived usefulness and perceived ease of use on the behavioral intention to use Google Apps. Besides, this study also tested mediation and moderated mediation effects by adding user training and support as a moderator variable. The research model is illustrated in Figure 1.

Data collection and sample

The unit analysis used is an individual, and the target population is lecturers or teaching staff at Public Universities and Private Universities. They were chosen because, during the Covid-19 pandemic, they have to change their learning method. This study used non-probability sampling (i.e.,

purposive sampling and snowball sampling). Purposive sampling used some criteria: 1) the teaching staff apply Google Apps for online learning for at least one semester during the Covid-19 pandemic, and 2) the teaching staff is not from an educational institution that implemented a full-time online learning system. Furthermore, this study also used the snowball sampling method to increase the response rate.

This study is a quantitative study with primary data and collected data through a survey method. This research took approximately a month for the data collection process, from December 3, 2020, to January 1, 2021. The data collected were 115 questionnaires, and 108 (93.9%) questionnaires that could be analyzed. The questionnaire was arranged in the google form and distributed through social media. Seven questionnaires indicate that respondents do not use Google Apps for their online learning.

Instrument testing

The measurements were adopted from previous studies. Perceived usefulness consisted of 6 items and perceived ease of use used six items from Davis (1989). In measuring behavioral intention to use technology, this study adopted two items from Vijayasarathy (2004). Furthermore, user training and support were measured using three items from Thompson et al. (1991). All instruments used a 5-point Likert scale (strongly agree, agree, neutral, disagree, strongly disagree).

The instruments were tested validity and reliability. There are a series of validity tests. First, the face validity test was conducted by considering the expert opinions. Second, content validity was done by matching the statement items in the instrument with the construct definition to be measured and the questionnaire items from previous studies. This study also did a pilot study to test whether the questionnaire could be understood by respondents or not. The results of the pilot study showed that there were 51 completed questionnaires. This study also conducted discussions with several respondents in the pilot study to obtain feedback on the questionnaires distributed.

Third, construct validity was carried out by testing the CFA (confirmatory factor analysis) and AVE (average variance extracted) values. The rule of thumb in Hair

Table 2.
The characteristics of respondents

Characteristics	N	%
1. Institution		
a. Public University	46	42,6%
b. Private University	62	57,4%
2. Location		
a. Sumatra	18	16,7%
b. Java	79	73,1%
c. Borneo	4	3,7%
d. Celebes	4	3,7%
e. Bali	2	1,9%
f. Nusa Tenggara	1	0,9%
g. Papua	0	0,0%
3. Gender		
a. Male	41	38,0%
b. Female	67	62,0%
4. Age		
a. < equal to 30 years	54	50,0%
b. 31 to 40 years	35	32,4%
c. 41 to 50 years	15	13,9%
d. 51 to 60 years	2	1,9%
e. > 60 years	2	1,9%
5. Education		
a. Master	101	93,5%
b. Doctor	7	6,5%
6. Field		
a. Natural	27	25,0%
b. Social/Humanities	81	75,0%
7. Learning method		
a. Synchronous	88	81,5%
b. Asynchronous	20	18,5%

et al. (2014) found that the factor loading value must be greater than 0.6 to be said to be valid. Meanwhile, all three items have a loading factor that is below 0.6. From CFA, some items were removed because they have a value below 0.6. They are PU1, PE2, and PE4. PU1 has a loading factor of 0.583.

Meanwhile, PE2 has a loading factor of 0.474, then PE4 has a loading factor of 0.346. Finally, the loading value of each item was analyzed by grouped according to its construct. It was conducted to test discriminant and convergent validity. Group 1 describes the value of the factor loading of the perceived usefulness of use (PU) items, while group 2 refers to the factor loading of the perceived ease of use (PE) items. Group 3 illustrated that items of the construct of behavior intention to use technology (BI), and group 4 on the user training and support (FC).

A reliability test is used to determine whether the instrument used is reliable enough or not. To do this test, it can be done by assessing Cronbach's Alpha. The results of Cronbach's Alpha test show that the four constructs used in this study are reliable. For more details, the results of the validity and reliability test can be seen in Table 1.

Table 3.
Hypothesis testing

Antecedent	Model 4				Model 15			
	PU		BI		PU		BI	
	Coefficient	P	Coefficient	P	Coefficient	P	Coefficient	P
Constant	2.612	0.010	3.390	0.001	-0.440	0.224	4.886	0.000
Age	1.599	0.113	-2.001	0.048	0.012	0.113	-0.013	0.023*
Gender	-1.489	0.139	-0.165	0.869	-0.189	0.139	-0.030	0.753
Field	-0.490	0.625	-0.298	0.766	-0.068	0.625	-0.054	0.627
Education	1.025	0.308	-1.089	0.279	0.154	0.308	-0.205	0.386
Method	0.185	0.853	1.033	0.304	0.028	0.853	0.167	0.230
PE	5.495	0.000*	3.257	0.002	0.522	0.000*	0.317	0.001*
PU	-	-	2.124	0.036	-	-	0.200	0.065**
FC	-	-	-	-	-	-	0.353	0.000*
PExFC	-	-	-	-	-	-	-0.288	0.022**
PUxFC	-	-	-	-	-	-	-0.078	0.418
	Bootstrap effect of mediation				Bootstrap effect of moderated mediation			
LL95%CI		0.032					-0.183	
UL95%CI		0.335					0.086	
F	6.506*		9.591*		6.506*		12.924*	
R ²	0.193		0.357		0.193		0.487	

Noted: N=108; *p>0.01; **p<0.05; ***p<0.10 (two-tailed test); Bootstrap sample size=5000; CI=confidence interval; LL=lower limit; UL=upper limit

RESULTS AND DISCUSSION

Respondents came from public universities (42.6%) and private universities (57.4%). From the working area, respondents are from Java (73,1%). Then, the majority of them are female (62%) and still young, around 30 until 40 years old. They also have a master's degree (93.5%) and came from social science (75%). They use synchronous and asynchronous learning methods. The details are resumed in Table 2.

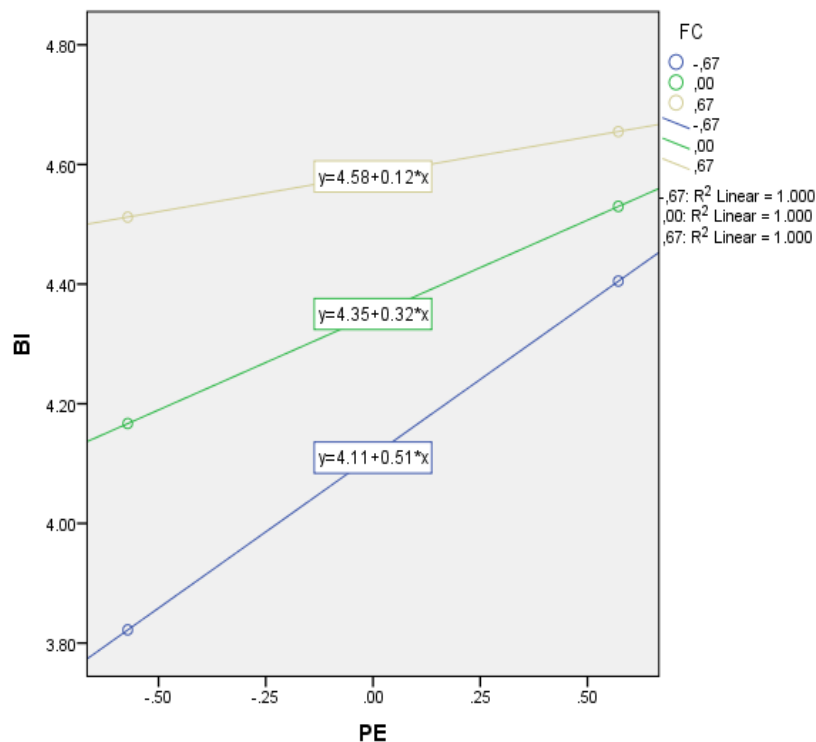
This study used SPSS Process 3.4 to test hypotheses. For the first step, Model 4 from Hayes (2018) was applied to test hypotheses 1, 2, and 3. However, this model cannot capture moderating effect. Simultaneous testing of the moderated mediation model (see Figure 1) was analyzed by applying Model 15. This model tested hypotheses 4a and 4b. Table 3 shows the hypothesis testing results.

The direct effect of the perceived usefulness has a significant positive effect on behavioral intention to use technology ($\beta = 0.200$; $p < 0.1$), so hypothesis 1 is supported. Furthermore, perceived ease of use behavioral intention to use technology has a significant positive ($\beta = 0.317$; $p < 0.01$). This means that hypothesis 2 is

supported. Then, the mediation effect of perceived usefulness on the relation of perceived ease of use and behavioral intention to use technology is shown in the result of Model 4. Indirect effects among them can be analyzed from bootstrap confidence intervals. Based on Hayes (2018), the bootstrap confidence interval can be considered when it is different from zero or between the bootstrap value of the lower limit (BootLLCI) and the upper limit (BootULCI) does not straddle zero. Model 4 shows that BootLLCI 0.032 and BootULCI 0.335. It is indicated that hypothesis 3 is supported. The moderating effect of user training and support on the mediation among perceived ease of use, perceived usefulness, and behavioral intention to use is analyzed. It is illustrated in Figure 1. The result shows that the moderating effect of user training and support does not occur on the effect of the perceived usefulness on behavioral intention to use technology ($\beta = 0.078$; $p = 0.418$). This means that hypothesis 4a is not supported.

To see moderated mediation effect, this study looks at the bootstrap value of the lower limit (BootLLCI) and the upper limit (BootULCI) on Model 15. This study used 95 confidence intervals and 5000 bootstrap

Figure 2.
Moderation effect at hypothesis 4b



samples. Based on the hypothesis test, it is known that the results are BootLLCI -0.183 and BootULCI 0.086. Following the rule of thumb that BootLLCI and BootULCI cannot straddle zero (see Hayes, 2018), these results indicate that the moderated mediation effect is not significant or there is no moderated mediation effect. On the other hand, the moderating effect of user training and support on the direct relationship between the perceived ease of use on behavioral intention to use shows that the moderation effect occurs ($\beta = 0.288$; $p < 0.05$). The result has a negative coefficient value. This means that hypothesis 4b is supported in the form of negative interaction. The moderation effect is shown in Figure 2.

Figure 2 draws that moderation of user training and support on the influence of perceived ease of use and willingness to use technology is debilitating. The existence of training and support will not make people who perceive the ease of using technology will be more convinced to behave using technology. For this reason, Figure 2 shows that the strong influence of moderation will reduce a person's desire to use technology.

This study found that age had a significant negative effect on the behavioral intention to use Google Apps ($\beta = -0.013$; $p < 0.05$). The negative effect shows that the older person has a lower intention to use Google Apps. Meanwhile, gender, the field of science, education, and learning methods did not have a significant effect on the desire to use technology.

Discussion

Perceived usefulness affects behavioral intention to use technology. This study result shows that the perceived usefulness has a significant positive effect on the behavioral intention to use Google Apps. An individual who perceives that technology provides use or benefits for what is done will tend to encourage him to use the technology. The result supports previous studies (e.g., Karahanna & Straub, 1999; Ramayah & Lo, 2007; Smith, 2008; Tung & Chang, 2008). From this research, teaching staff who perceive that Google Apps provides benefits to support the online learning process will adopt it.

Perceived ease of use also affects the behavior intention to use technology. When an individual believes that the technology is easy to operate, he/she will tend to adopt it. This study result found that the effect of

perceived ease of use on the behavioral intention to use Google Apps is positively significant. It is in line with previous studies where the perceived ease of use technology is a factor considered by someone to use or adapt technology (e.g., Fagan et al., 2008; Ramayah & Lo, 2007). This result also implies that the perceived ease of use of Google Apps encourages teaching staff to use Google Apps in their online learning.

Prior studies found that perceived ease of use predicted the perceived usefulness (Kanchanataneet et al., 2014; Leong et al., 2011; Ramayah & Lo, 2007). The individual perceives that the technology is useful because he/she believes that it is easy to operate (Leong et al., 2011). From them, this study assumed that the relation of perceived ease of use and behavioral intention to use technology is mediated by perceived usefulness. The study result found that there is a mediation effect. Because perceived ease of use directly affects behavioral intention to use, the effect of partial mediation is confirmed. An individual who perceives that technology is ease of use does not mean he/she will adopt the technology. Sometimes, he/she also considers the benefit of using technology.

The moderated mediating effect of user training and support on perceived usefulness and perceived ease of use on behavioral intentions to use the technology showed insignificant results. User training and support will not influence a person's intention to adopt technology if that person already knows or feels the benefits of it. This cannot be separated from the adoption of technology by someone because of their need for this technology. In this case, the teaching staff considers adopting Google Apps according to their needs and seeing the benefits of Google Apps in online learning. The existence of training and support will not affect their perception of the benefits of Google Apps.

Meanwhile, user training and support moderated the effect of perceived ease-to-use on behavioral intention to use technology. The impact of moderation is negative. The more people get training and get support, the more people will hesitate to adopt the technology. When someone has the perception that using technology is easy, it turns out that training and support make someone weaker to adopt the technology. This could have happened in this case, namely a teaching staff who previously felt that Google Apps was easy to change their

mind and felt hesitant to adopt the technology. The effect of training and support weakens the relationship between the perceived ease of use of technology and the behavioral intention to use technology.

Besides, age also influences the behavioral intention to use technology. The effect is a significant negative. The younger the teaching staff, the more likely they are to adopt Google Apps as their online learning technology.

CONCLUSION

Behavioral intention to use Google Apps in online learning can be influenced by perceived usefulness and the application's ease of use. These factors are the implementation of TAM developed by Davis (1989). In this study, the concept is explored by examining the moderated mediation effect the user training and support. And at the end of the research, this study also found that age affects the behavioral intention to use Google Apps.

Perceived usefulness and perceived ease of use of teaching staff directly influenced the behavioral intention to use Google Apps. However, the effect of perceived ease of use can occur indirectly. Even though the teaching staff perceives Google Apps as easy to adopt, they also consider the function. Maybe, it causes Google Apps to have many features that not all of them are adopted. Teaching staff must consider the features that give benefits. Moderating effect of user training and support only occurs in the relation of perceived ease of use and behavioral intention to use. Meanwhile, moderated mediation effect is not confirmed. Age also influences the behavior intention to use Google Apps.

The implications of this research can be assessed from its theoretical and practical benefits. For theoretical implications, this study provides additional empirical evidence on the implications of TAM in analyzing technology adoption, particularly the use of Google Apps. Also, this study adds to the evidence of a moderating effect of user training and support on the effects of perceived ease of use on behavioral intention to use technology. Then, for practical implications, this study informs policymakers in higher education institutions that the existence of training and support does not make people think Google Apps will tend to use it more often. This may be

because the guides for using Google Apps are easy to find and someone will be accessing the guides and intending to use Google Apps features because that person needs them. It also supports where perceived usefulness influences someone to want to use Google Apps.

This study has several limitations and some suggestions for future research. First, this study examines Google Apps that is more familiar and widely used by people. Many technologies can be used, such as Zoom, Microsoft Team, Cisco Webex, and several other e-learning. Each learning application has different features and uses. For example, Zoom is more familiar with video conferencing with various features. However, this application is not applicable for asynchronous lectures. Then, e-learning is designed more specifically for a campus. It is more difficult to get guidelines is than applications that are open to the public. Therefore, it is a chance that future research studies the adoption of other applications outside of Google Apps. Future research may explore other learning technologies for research. It is necessary to explain a little about the differences in characteristics between Google Apps and other e-learning so that it deserves to be future research.

Second, during the Covid-19 pandemic, online learning was not only carried out at the college level. Almost all educational institutions change their operational activities from offline to online, such as schools. Therefore, further research can examine other educational institutions. Finally, changes in company operations during the Covid-19 pandemic did not only occur in the education sector. Day-to-day operations in other sectors have also changed a lot. Several public and private organizations showed changes to their activities from offline to online. In this change, the company also adopted the technology. Future research can examine the adoption of technology by employees in non-educational sector companies.

REFERENCES

- Ajzen, Icek. (1985). From intentions to actions: A theory of planned behavior. *Action Control*, 11–39.
- Ajzen, I. (2002). Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior. *Journal of Applied Social Psychology*, 32(4), 665–683.

- Al-Suqri, M. N. (2014). Perceived usefulness, perceived ease-of-use and faculty acceptance of electronic books: An empirical investigation of Sultan Qaboos University, Oman. *Library Review*, 63(4–5), 276–294.
- Awuah, L. (2015). Supporting 21st-Century teaching and learning: The role of Google Apps for Education. *Journal of Instructional Research*, 4(2015), 12–22.
- Basri, H., Hashim, H., & Yunus, M. (2019). Using Google Apps as learning strategy to enhance ESL writing. *Creative Education*, 10(2008), 2649–2657.
- Beldarrain, Y. (2006). Distance education trends: Integrating new technologies to foster student interaction and collaboration. *Distance Education*, 27(2), 139–153.
- Chen, Ko, H.-C., Kinshuk, & Lin, T. (2005). A model for synchronous learning using the Internet. *Innovation in Education and Teaching International*, 42(2), 181–194.
- Chu, T. H., & Robey, D. (2008). Explaining changes in learning and work practice following the adoption of online learning: A human agency perspective. *European Journal of Information Systems*, 17(1), 79–98.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly: Management Information Systems*, 13(3), 319–339.
- Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science*, 35(8), 982–1003.
- Davis, F. D., & Venkatesh, V. (1996). A critical assessment of potential measurement biases in the technology acceptance model: Three experiments. *International Journal of Human Computer Studies*, 45(1), 19–45.
- Dhawan, S. (2020). Online Learning: A Panacea in the Time of COVID-19 Crisis. *Journal of Educational Technology Systems*, 49(1), 5–22.
- Doll, J., & Ajzen, I. (1992). Accessibility and stability of predictors in the theory of planned behavior. *Journal of Personality and Social Psychology*, 63(5), 754–765.
- Fagan, M. H., Neill, S., & Wooldridge, B. R. (2008). Exploring the intention to use computers: An empirical investigation of the role of intrinsic motivation, extrinsic motivation, and perceived ease of use. *Journal of Computer Information Systems*, 48(3), 31–37.
- Grunberg, L., Moore, S., Greenberg, E. S., & Sikora, P. (2008). The changing workplace and its effects: A longitudinal examination of employee responses at a large company. *Journal of Applied Behavioral Science*, 44(2), 215–236.
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2014). Multivariate data analysis. In *Neuromarketing in India: Understanding the Indian Consumer* (Seventh). New Jersey: Pearson.
- Hayes, A. F. (2018). *Introduction mediation, moderation, and conditional process analysis: A regression-based approach*. The Guildford Press.
- Hubbard, P. (2013). Making a case for learner training in technology enhanced language learning environments. *CALICO Journal*, 30(2), 163–178.
- Hussain, A., Mkpojiogu, E. O. C., & Yusof, M. M. (2016). Perceived usefulness, perceived ease of use, and perceived enjoyment as drivers for the user acceptance of interactive mobile maps. *AIP Conference Proceedings*.
- Jahangir, N., & Begum, N. (2007). Effect of perceived usefulness, ease of use, security and privacy on customer attitude and adaptation in the context of E-Banking. *Journal of Management Research*, 7(3), 147–157.
- Kanchanatane, K., Suwanno, N., & Jarernvongrayab, A. (2014). Effects of attitude toward using, perceived usefulness, perceived ease of use and perceived compatibility on intention to use e-marketing. *Journal of Management Research*, 6(3), 1–13.
- Karahanna, E., & Straub, D. W. (1999). The psychological origins of perceived usefulness and ease-of-use. *Information & Management*, 35, 237–250.
- Keengwee, J., Kidd, T., & Kyei-Blankson, L. (2009). Faculty and technology: Implications for faculty training and technology leadership. *Journal of Science Education and Technology*, 18(1), 2008–2010.
- Kuo, Y., & Yen, S. (2009). Towards an understanding of the behavioral intention to use 3G mobile value-added services. *Computers in Human Behavior*, 25(1), 103–110.
- Kusumah, E. P. (2018). Technology acceptance model (TAM) of statistical package for the social sciences (SPSS) applications. *Integrated Journal of Business and Economics*, 2(1), 1–11.

- Lai, P. C. (2017). The literature review of technology adoption models and theories for the novelty technology. *JISTEM - Journal of Information Systems and Technology Management*, 14(1), 21–38.
- Leong, L., Ooi, K., & Lin, B. (2011). Influence of individual characteristics, perceived usefulness and ease of use on mobile entertainment adoption. *International Journal of Mobile Communications*, 9(4), 359–382.
- Ni, A. Y. (2013). Comparing the effectiveness of classroom and online learning: Teaching research methods. *Journal of Public Affairs Education*, 19(2), 199–215.
- Ramayah, T., & Lo, M.-C. (2007). Impact of shared beliefs on “perceived usefulness” and “ease of use” in the implementation of an enterprise resource planning system. *Management Research News*, 30(6), 420–431.
- Ramdhani, N. (2016). Penyusunan alat pengukur berbasis theory of planned behavior. *Buletin Psikologi*, 19(2), 55–69.
- Smith, T. J. (2008). Senior citizens and e-commerce websites: The role of perceived usefulness, perceived ease of use, and web site usability. *Informing Science: The International Journal of an Emerging Transdiscipline*, 11, 59–83.
- Sugar, W., Crawley, F., & Fine, B. (2004). Examining teachers’ decisions to adopt new technology. *Journal of Educational Technology & Society*, 7(4), 201–213.
- Suki, N. M., & Suki, N. M. (2011). Exploring The Relationship Between Perceived Usefulness, Perceived Ease of Use, Perceived Enjoyment, Attitude and Subscribers’ Intention Towards Using 3G Mobile Services. *Journal of Information Technology Management*, XXII(1), 1–7.
- Thompson, R. L., Higgins, C. A., & Howell, J. M. (1991). Personal computing: Toward a conceptual model of utilization. *MIS Quarterly: Management Information Systems*, 15(1), 125–142.
- To, P. L., Liao, C., Chiang, J. C., Shih, M. L., & Chang, C. Y. (2008). An empirical investigation of the factors affecting the adoption of Instant Messaging in organizations. *Computer Standards and Interfaces*, 30(3), 148–156.
- Tung, F., & Chang, S. (2008). Nursing students’ behavioral intention to use online courses: A questionnaire survey. *International Journal of Nursing Studies*, 45(18), 1299–1309.
- Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences*, 39(2), 273–315.
- Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, 46(2), 186–204.
- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425–478.
- Vijayasathya, L. R. (2004). Predicting consumer intentions to use online shopping: The case for an augmented technology acceptance model. *Information and Management*, 41(6), 747–762.