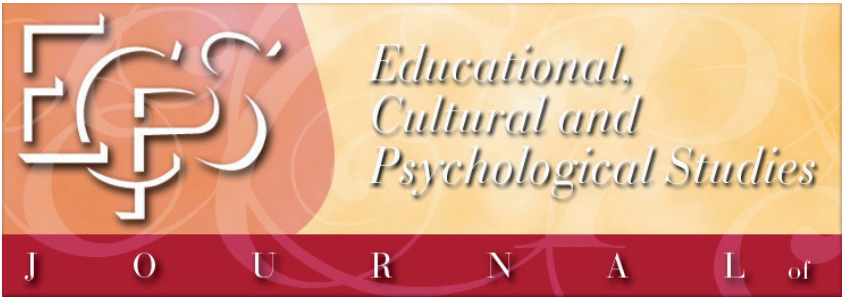

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Understanding Students' Intention to Use Mobile Learning at Universitas Negeri Semarang: An Alternative Learning from Home During Covid-19 Pandemic

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COMPRENDERE LA DISPONIBILITÀ DEGLI STUDENTI ALL'USO DEI DISPOSITIVI MOBILI PER UN APPRENDIMENTO ALTERNATIVO DA CASA DURANTE LA PANDEMIA DEL COVID-19

Abstract

Coronavirus Disease (Covid-19) pandemic influenced education systems throughout the world, including in Indonesia. It makes the universities and schools go online for their teaching-learning process. Therefore, mobile learning can be an alternative solution to carry out the teaching and learning process as suggested by the government. The purpose of this study was to explore empirically mobile learning acceptances based on Technology Acceptance Model (TAM) with satisfaction as the mediating variable. The population of this study is 250 Economics Education students at Universitas Negeri Semarang. The sample was taken by purposive sampling with the criteria of students who have used

mobile learning in supporting their learning activities. Structural Equation Model (SEM) with AMOS 24 was performed to analyze quantitative data. The results showed that from 6 hypotheses, there are 5 accepted hypotheses; they are; perceived ease of use, perceived usefulness, and perceived interactivity have positive and significant effects on the intention to use mobile learning. The mediating variable (satisfaction) is successful to strengthen the influence between perceived ease of use and intention; and perceived usefulness and intention. However, satisfaction is rejected to mediate perceived interactivity and intention to use. Stakeholders should improve students' satisfaction in their learning activities. The limitation of this study was the research results cannot be easely generalized in other contexts. In the future, other researchers can add other factors to examine better technology acceptance.

Keywords: Intention to use m-learning; Perceived ease of use; Perceived interactivity; Perception of usefulness; Satisfaction; University students.

1. Introduction

Coronavirus Disease (Covid-19) was declared a pandemic disease (WHO, 2020) and makes many countries in the world severe. More programs and policies need to be taken to avoid the spread of the virus. As a result, the Indonesian government closed schools and universities and suspended all instructional instructions in the classroom until further notice. Thus, this pandemic indirectly has an impact on educational provisions. The current pandemic situation raises many concerns, such as a decline in education quality and students' performance (Usak *et al.*, 2020).

To respond to the government policy on education in this pandemic, higher education leaders stop face-to-face academic activities. It made all lecturers carry out the teaching-learning process online via the internet. The online teaching-learning process is challenging for most Indonesian people in the era of industrial revolution 4.0. It is because in 2020 Indonesia has just officially issued a higher education policy to fulfill the demands of the 4.0 industrial revolution; it is called an *Independent Campus*. This program opens a wide space for students to expand their studies and learning areas that become their focus and interest.

Therefore, the adoption of innovative teaching techniques and approaches is important to strengthen and improve education quality (Eryilmaz, 2015; Sarac, 2017; Toquero, 2020). Pischetola and Heinsfeld (2018) find that Information and Communications Technology (ICT) is

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increasingly a part of discussions on educational innovation and teaching practices.

Mobile learning can be an exciting teaching innovation. Mobile learning is defined as mobile devices in education (Crompton & Burke, 2018; Sönmez *et al.*, 2018). Mobile learning can utilize the website, videos, applications, audios, or other internet learning sources accessed by mobile phone. They are a lot of learning resources on the internet. The usefulness and advantages of using mobile learning are the teaching methods provided can be done anywhere and anytime with a learning process that is unlimited to only one particular place (Joseph *et al.*, 2007). The empirical evidence shows that mobile learning can support students in their learning activities (Liu *et al.*, 2010; Mac Callum, Jeffrey, & Na, 2014; Hamidi & Chavoshi, 2018). The use of mobile learning is considered to be beneficial for both teachers and students. Many researchers are interested in investigating the factors of application user acceptance based on the Technology Acceptance Model (TAM) (Aubusson, Schuck, & Burden, 2009).

TAM is analyzed for adoption behavior in various information systems or new technology. TAM examines the factors influencing the behavioral intention to use new technologies, there are 2 (two) primary constructs; i.e. perceived usefulness and perceived ease of use (Davis & Davis, 1989). The advantages of implementing TAM are first, this model considers the user's perspective (Davis, Bagozzi, & Warshaw, 1989; Adams *et al.*, 1992). Second, it allows measuring the effects of perceptions of interactivity, achievement, and satisfaction with learning applications. Third, there are many different results of previous studies based on TAM on the adoption of the new technology in higher education (Miller & Khera, 2010; Xu & Gan, 2010; Sheikhshoaei & Oloumi, 2011; Detlor *et al.*, 2012; Aharony, 2014; Joo & Choi, 2015; Potrich, Vieira, & Mendes-Da-Silva, 2016).

Then, it needs to conduct investigations related to students' intention to use mobile learning. This study has two questions investigating what factors influence users' intention to use mobile learning (m-learning). TAM is applied to the acceptance of m-learning users. The purpose of this study is to investigate Perceived Ease of Use (PEU), Perception of Usefulness (PU), Perceived Interactivity (PI) on behavioral intention to use m-learning. Then, to improve educational services through mobile learning, this study also uses the Satisfaction (SAT) factor to mediate between those TAM factors on intention to use mobile learning. The findings of this study provide usefulness for researchers and education practitioners. This study's results can be the basis for improving teaching and learning innovation in higher education during the Covid-19 pandemic.

2. Methodology

2.1. *Instrument*

Table 1. – The instrument of the study.

Constructs	Items	Descriptions	Sources
Perceived Ease of Use (PEU)	PEU01	Using m-learning does not need much effort or sacrifice	Davis, 1989; 1993
	PEU02	I recognize m-learning easy to use	
	PEU03	I distinguish m-learning as easy to access, and I can use m-learning anytime and anywhere	
Perception of Usefulness (PU)	PU01	In my opinion, m-learning is useful to me	Davis, 1989; 1993
	PU02	The m-learning apps facilitate me to use learning service more quickly	
	PU03	I find that m-learning can save my time more efficient and effective	
Perceived Interactivity (PI)	PI01	Response speed and access of m-learning is fast	Ha & James, 1998
	PI02	In my opinion, the content of m-learning is beneficial to me	
	PI03	M-learning is beneficial to use conveniently at any time.	
	PI04	M-learning is doable to use conveniently anywhere	
Satisfaction (SAT)	SAT01	I am satisfied with m-learning	DeLone & McLean, 2003; Park & Kim, 2013
	SAT02	The m-learning that I am now using meets my expectations	
	SAT03	The m-learning is a convenient tool in improving my life	
Intention to Use (ITU)	ITU01	I propose to use m-learning as much as possible	Davis, 1989; 1993
	ITU02	I expect to continue using m-learning again	
	ITU03	I recommend m-learning services to all of my friends	

Data collection instruments refer to devices used to collect data as Hill *et al.*, 1977; Davis *et al.*, 1989; Davis, 1993; Venkatesh & Davis, 2000 described in 16 statements i.e. Perceived Ease of Use (PEU), Perceived of Usefulness (PU), and Perceived Interactivity (INT). It has a five-point Likert scale from strongly disagree (one point) to strongly agree (five-point) to respond to statements from the questionnaire (*Tab. 1*).

2.2. *Subject*

The population of this study is 250 Economics Education students of Universitas Negeri Semarang (UNNES). There are 147 students as the samples of the study calculated with the Slovin formula with an error tolerance of 5%. The sample was taken by purposive sampling with the criteria of students who have used mobile learning in supporting their learning activities. The questionnaire covered a wide range of aspects according to the devices, and it has been distributed for two weeks through Google form. Data of respondents can be seen in *Table 2*.

Table 2. – Data of demographic.

Information	Characteristics	Frequency	%
Gender	Male (M)	32	21.7
	Female (F)	115	78.3
Age	< 20 years old	33	22.4
	20-30 years old	96	65.3
	31-40 years old	17	11.6
	> 40 years old	1	0.7
Level of education	S1 (Bachelor)	147	100

2.3. *Research framework*

TAM is the leading theory used in this study because it emphasizes the user's perception will determine his attitude in m-learning. This study uses three constructs from the tam research model: perceived ease of use perceived usefulness, and perceived interactivity. *Figure 1* illustrates the frame of mind in this study.

Perceived ease of use is a perception of ease of use that leads to the cognitive efforts needed to learn and utilize new technologies. If the proce-

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dure required to use m-learning is simple, easy to use, and does not require skills, the product will be considered to provide many benefits. Therefore, the first hypothesis is that Perceived Ease of Use (PEU) has a positive and significant effect on the Intention to Use m-learning (ITU)

Perceived usefulness is a level of trust in using a particular subject that can benefit the person who uses it. In this case, the intended subject is the intention in using m-learning, then the second hypothesis is Perceived Usefulness (PU) has a positive and significant effect on the Intention to Use m-learning (ITU).

Perceived interactivity is a form of feeling that the user feels when doing an activity related to the m-learning application's features. In other words, perceived interactivity refers to a feeling of satisfaction both psychologically and the features provided, which will increase the user's intention to use m-learning on an ongoing basis. Therefore, the third hypothesis is that Perceived Interactivity (PI) has a positive and significant effect on using m-learning (ITU).

Associated with satisfaction, the definition of student satisfaction is one of the benchmarks of m-learning quality. The level of student satisfaction of m-learning users can show students enjoying the online learning process. Quality learning will have a high level of satisfaction for its users. Therefore, student satisfaction becomes an intervening variable that connects perceived ease of use, perceived usefulness, perceived interactivity to intention to use m-learning.

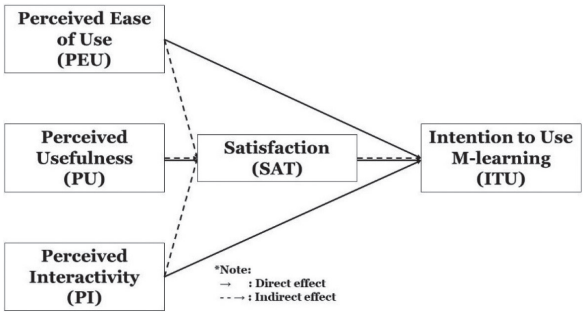

Figure 1. – Research framwork.

2.4. *Hypotheses*

A hypothesis is a supposition or a temporary answer to a problem to be tested. The central premise of the present study can be seen in *Table 3*.

Table 3. – Hypotheses.

No	Hypotheses
H_1	Perceived Ease of Use (PEU) has a positive and significant effect on the Intention to Use m-learning (ITU)
H_2	Perceived Usefulness (PU) has a positive and significant effect on the Intention to Use m-learning (ITU)
H_3	Perceived Interactivity (PI) has a positive and significant effect on the Intention to Use m-learning (ITU)
H_4	Perceived Ease of Use (PEU) has a positive and significant effect on the Intention to Use m-learning (ITU) through Satisfaction (SAT)
H_5	Perceived Usefulness (PU) has a positive and significant effect on the Intention to Use m-learning (ITU) through Satisfaction (SAT)
H_6	Perceived Interactivity (PI) has a positive and significant effect on the Intention to Use m-learning (ITU) through Satisfaction (SAT)

2.5. *Data analysis*

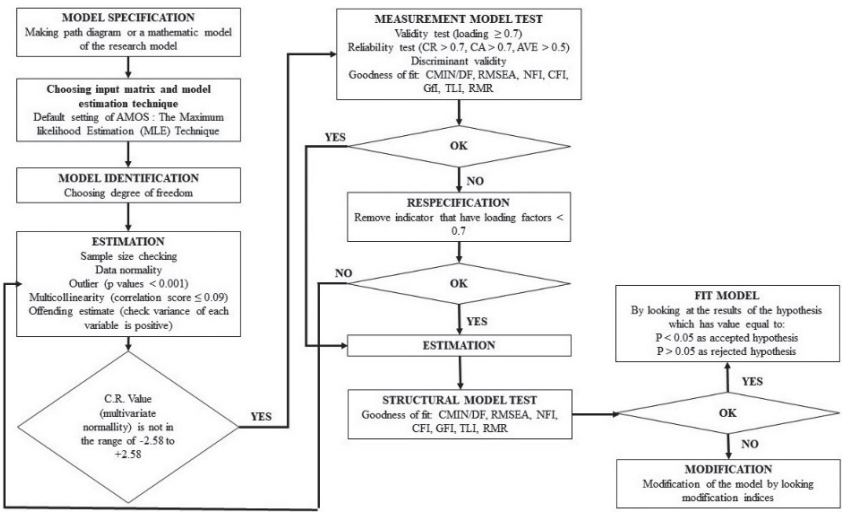

Figure 2. – Data analysis strategy.

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Data were analyzed using two (2) software; SPSS 24 and AMOS 24. SPSS 24 is for checking assumptions and AMOS 24 is to test the validity, reliability, and Goodness of Fit Index and the hypotheses. Both software is designed to support a structural model in the measurement and hypothesis testing. The data analysis strategy is shown in *Figure 2*.

2.6. *Screening of data*

Data screening is to ensure the data normality before it is conducted by further statistical analysis. This process is to check the accuracy of the data. It was examined by Kurtosis and Skewness, with a range determined ±3 and ±1 (Rafique *et al.*, 2018). The data of the study are distributed without any problems or normal because the value of Kurtosis and Skewness is less than ±1.

2.7. *Structural Equation Model (SEM)*

SEM is to measure several items to construction in multivariate. This model also identifies the relationship among independent and dependent variables simultaneously (Hair *et al.*, 2010). Then, two steps need to be done in analyzing SEM (Gerbing & Anderson, 1992); first, the model analysis is realized to determine the relationship between the observed variables and the CFA's unobserved variable with AMOS, and second; analyzing the hypotheses of the study. It also uses the coefficient parameter, and a useful Fit Index determined from the SEM fit (Hair *et al.*, 2010).

3. Result and discussion

Based on the Kaiser-Mayer-Olkin EFA test (KMO) with the result of the KMO value is 0.791, and the Barlett test value or P is 0.000 (less than 0.001), it proves that the sample is appropriate (Espejo, 2000).

This measurement examines the observed variables (Chandio *et al.*, 2017; Rafique *et al.*, 2018). It was then evaluated using CFA, which was carried out with discriminatory, convergent validity, and reliability (Hair *et al.*, 2010). Using this model, the value of each variable's composite reliability is above 0.7 (Straub & Gefen, 2004). Based on Hair *et al.* (2010), the same result value also happens to the AVE of each variable which is

more than 0.7. It means that the values are accepted for discriminant validity (Straub & Gefen, 2004). It means that the results correspond to the Goodness Fit Index. Then, Cronbach's Alpha (cut-off value = 0.7) is used to check the reliability of the questionnaire (Nunnally, Bernstein, & Berge, 1967). Validity and reliability can be seen in *Table 4* and Exploratory Factor Analysis can be seen in *Table 5*.

Table 4. – The results of validity and reliability.

Constructs	Items	Factor loading	CR	AVE	A
PEU	PEU01	0.903	0.82	0.74	0.863
	PEU02	0.883			
	PEU03	0.914			
PU	PU01	0.880	0.98	0.73	0.861
	PU02	0.911			
	PU03	0.896			
PI	PI01	0.785	0.87	0.72	0.810
	PI02	0.828			
	PI03	0.760			
	PI04	0.773			
SAT	SAT01	0.913	0.88	0.76	0.848
	SAT02	0.880			
	SAT03	0.787			
ITU	ITU01	0.840	0.82	0.74	0.834
	ITU02	0.714			
	ITU03	0.859			

Table 5. – Exploratory factor analysis result.

Constructs	PEU	PU	PI	SAT	ITU
Perceived Ease of Use (PEU)	0.83				
Perceived of Usefulness (PU)	0.56	0.73			
Perceived Interactivity (PI)	0.70	0.63	0.76		
Satisfaction (SAT)	0.40	0.58	0.74	0.86	
Intention to Use (ITU)	0.36	0.62	0.14	0.22	0.74

The structural model by SEM can show the statistical coefficient of determination or R^2 and path coefficients implying the causal connection. The R^2 explains the construction estimate; whereas the path coefficient reinforces the proposed hypothesis. Both determination and coefficient values

describe the data against the idea (Lee, 2010). The structural model is in line with the causal connection measured by the measurement model's Fit Index. *Table 7* explains the cut-off value index (Hair *et al.*, 2010).

The hypotheses outputs by the structural model are showed in *Table 5*. As stated previously; there are 6 (six) hypotheses; 3 (three) hypotheses have direct effects and 3 (three) hypotheses have indirect effects on intention through satisfaction as the mediating variable. The hypotheses are then analyzed with AMOS which can be seen in *Table 6*.

Table 6. – Testing hypotheses.

	Hypotheses			β-values	t-values	p-value	Status
H_1	PEU	=>	ITU	0.403***	4.289	0.000	Accepted
H_2	PU	=>	ITU	0.374***	3.935	0.000	Accepted
H_3	PI	=>	ITU	0.629***	7.893	0.000	Accepted
H_4	PEU	=> SAT =>	ITU	0.637***	8.057	0.000	Accepted
H_5	PU	=> SAT =>	ITU	0.619***	7.690	0.000	Accepted
H_6	PI	=> SAT =>	ITU	0.614***	7.588	0.065	Rejected

The data of the study model is crucial. Hence, these are evaluated by χ2, AGFI, RMSEA, GFI, CFI, and NFI. As in *Table 7*, Fit Index fulfilled the recommended range; such as CMIN/df = 1.977, RMSEA = 0.058, GFI = 0.967, AGFI = 0.922, CFI = 0.914, and NFI = 0.945 (Schreiber *et al.*, 2006; Hair *et al.*, 2010; Ferdinand, 2014).

Table 7. – Direct, indirect, and total effects.

Factors	Effect on								
	Perceived Ease of Use (PEU) (R^2 = 16.2%)			Perceived Usefulness (PU) (R^2 = 14%)			Perceived Interactivity (PI) (R^2 = 39.6%)		
	D	*I*	*Total*	*D*	*I*	*Total*	*D*	*I*	*Total*
SAT	0.172	0.000	0.172	0.196	0.000	0.196	0.258	0.000	0.258
ITU	0.109	0.081	0.028	0.000	0.093	0.093	3.90	0.122	0.512

Note: All values are significant at $p < 0.001$.

The first hypothesis shows that the critical ratio of the proposed hypothesis is more than 1.96. Therefore, it supports H_1 with the value β = 0.403***, CR = 4.289, p = 0.000. It means that perceived ease of use (PEU) has a positive and significant effect on the behavioral intention to use m-learning

applications. This finding is in line with Hubert *et al.* (2017), Venkatesh, Thong, and Xu (2012). Lazzari (2014) also finds that the ease of use of the proposed instruments enabled the persons involved in the experimentation to improve their communication capabilities, to better express their choices and feelings, and to extend their communication circles.

The second hypothesis is accepted that Perceived Usefulness (PU) has a positive and significant effect on ITU since the value $\beta = 0.374^{***}$, CR = 3.935, $p = 0.000$ (a significant positive effect on ITU). This finding supports the previous studies done by Aubusson *et al.* (2009); Chen, Shih-Chih, and Shing-Han Li (2011); Jeong (2011); Al-Emran, Mezhuyev, and Kamaludin (2018); Chavoshi (2018); Alshehri, Rutter, and Smith (2019); Hamidi and Sholikah and Sutirman (2020).

The third hypothesis is accepted that perceived interactivity has a positive and significant effect on the intention to use m-learning with the value $\beta = 0.629^{***}$, CR = 7.893, $p = 0.0001$. This positive and significant effect supports the previous studies by Rafique *et al.* (2018).

It is also found that satisfaction can mediate the Perceived Ease of Use (PEU) and Perceived Usefulness (PU) effect on Intention to Use m-learning (H_4 and H_5). Based on Callarisa Fiol, Bigne Alcaniz, Moliner Tena, and Garcia (2009), Perceived Ease of Use (PEU) and Perceived Usefulness (PU) have a significant positive effect on the Intention to Use m-learning (ITU) apps through PEM. Besides, the ease and usefulness of using technology also have the positive potential for customer satisfaction (Misnan, Zakaria, & Campus, 2018).

However, the sixth hypothesis is rejected because perceived interactivity gives a positive but insignificant effect on the intention to use m-learning through satisfaction.

Table 8. – The result of the structural model.

Fit Index	Value	Critical (acceptable) Value (Schreiber *et al.*, 2006 Hair *et al.*, 2010 Ferdinand, 2014)	Acceptability
CMIN/df	1.977	< 3	Yes
GFI	0.967	≥ 0.90	Yes
RMSEA	0.058	< 0.5	Yes
AGFI	0.922	≥ 0.90	Yes
CFI	0.914	≥ 0.90	Yes
NFI	0.945	≥ 0.90	Yes

3.1. *Theoretical contribution*

A theoretical contribution needs specific research results contributing original insights into the phenomenon studied effectively for improving the organization (Corley & Dennis, 2011). Based on the finding, this study grants the earliest wisdom depend on empirical data about Perceived Ease of Use (PEU) and Perceived Usefulness (PU) effects on intention to use m-learning through Satisfaction (SAT). Both Perceived Ease of Use (PEU) and Perceived Usefulness (PU) can identify intention to use m-learning from a practical perspective. Therefore, this study gives an essential contribution to the education field. In a more specific way, the study contributes to variables that affect service quality in improving organizational performance.

3.2. *Implications for management*

The results of the study presented its implications for education and management. First, the study examined that the determinants of adopting a mobile learning system; Perceived Ease of Use (PEU) and Perceived Usefulness (PU) had a significant effect on the behavioral Intention to Use m-learning (ITU).

The result is in line with other researchers' findings. First, Azizi and Khatony (2019) studied factors affecting medical sciences students' intention to adopt mobile learning. They found that PU and PEU have a significant effect on the intention to adopt mobile learning. Second, Aburub and Alnawas (2019) with their research on factors that influence the adoption of mobile learning in higher education: An empirical investigation. Data were collected from 820 students from ten universities in Jordan. Structural equation modeling (AMOS 18) was used to analyze the data. The findings of the current research reveal that Perceived Ease of Use (PEU) and Perceived Usefulness (PU) had a positive effect on the intention to adopt mobile learning. It was also stated that PEU had the highest impact on intention.

To maximize the action, the developers of mobile learning systems need to design systems that are useful and easy to use. This gives a solution to improve the quality of educational services and also improve student learning outcomes.

Nowadays, the digital-based learning model is on a large scale or covers almost all regions in Indonesia even though this model does not yet fully reach the lower social strata in society. Online learning requires

a condition; it is access to digital information, and some students do not have the same access since the uneven availability of digital infrastructure.

The challenge for lecturers and students is related to the use of learning technology that should be continuously improved. Moreover, the content of online learning needs to be refined to make it more interactive so that it allows students to be more engaged in the learning process. The quality of technology support also needs to be continuously improved, as are the facilities used by content provider companies.

Lecturers should be prepared with intense communication with students, some conversation channels such as WhatsApp, forums, and video calls to serve students during the current pandemic. It is expected to develop the quality of learning.

We can see that all parties undergoing online lectures experience uncomfortable for both lecturers and students. Technical problems are one of the obstacles and problems in the online teaching and learning process. The technical problems encountered usually start from quota problems, signals, to obstacles from the online application that we use.

Therefore, in general, we are not completely ready to conduct online lectures at this time, moreover, many students complain about their failure to understand the material presented online. It is understood because both students and lecturers do not have any transition and adaptability from a learning process like this before.

Then, educational institutions need to encourage and facilitate educators to use mobile learning optimally and ensure users use mobile learning effectively. The educational institutions are also responsible for providing socialization or training for students on the use of mobile systems to utilize the system well.

4. Conclusion

The technological advancements in the education sector lead to change from traditional classrooms to digital ones. This study presented to making clarification and understanding of the user behavior on the intention to use of mobile learning. The advancements made such a significant rapid change; thus, the use of technology is highly dependent on all factors. The model contributes important information for improving and understanding the behavioral intention to use m-learning.

The study results show that PEU, PU, PI, SAT have positive and significant effects on the intention to use m-learning. Hence, mobile learn-

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ing systems developers have to safeguard these factors and build the core TAM, they are Perceived Ease of Use (PEU), Perceived Usefulness (PU), and Perceived Interactivity (PI) to develop mobile applications.

However, the study also has the limitation since it is generalized only on the context of the study. For future studies, it is to consider adding the mediating and moderating variables to strengthen the research model.

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Riassunto

La malattia da coronavirus (Covid-19) ha influenzato i sistemi educativi di tutto il mondo, incluso quello dell'Indonesia. Essa ha portato a utilizzare nelle università e nelle scuole le modalità didattiche online per il loro processo di insegnamento-apprendimento. Di conseguenza, il mobile learning può rappresentare una soluzione alternativa per il processo di insegnamento e apprendimento. Lo scopo di questo studio era quello di esplorare le accettazioni dell'apprendimento mobile empiricamente basate sul Technology Acceptance Model (TAM) rilevando il livello di soddisfazione esperito quale variabile di mediazione. I partecipanti allo studio sono 250 studenti di Scienze dell'Economia presso l'Universitas Negeri Semarang. Il campione è stato estratto mediante campionamento intenzionale rispetto al criterio «studenti che hanno utilizzato il mobile learning a supporto delle loro attività di apprendimento». È stato eseguito il modello di equazione strutturale (SEM) con AMOS 24 per analizzare i dati quantitativi. I risultati hanno mostrato che rispetto alle 6 ipotesi formulate, ci sono 5 ipotesi accettate. Esse riguardano: la facilità d'uso percepita, l'utilità percepita e l'interattività percepita hanno effetti positivi e significativi sull'intenzione di utilizzare il mobile learning. La variabile media-

trice (livello di soddisfazione) riesce a rafforzare l'influenza tra la facilità d'uso percepita e l'intenzione; e l'utilità e l'intenzione percepite. Tuttavia, la soddisfazione non risulta incidere come mediatore tra l'interattività percepita e l'intenzione di utilizzare tali dispositivi. Si dovrebbero quindi migliorare i livelli di soddisfazione degli studenti nelle loro attività di apprendimento. Il limite di questo studio riguarda il fatto che i risultati non possono essere facilmente generalizzati ad altri contesti. In futuro, altri ricercatori potranno cercare di identificare ulteriori fattori che incidano su una migliore accettazione della tecnologia.

Parole chiave: Facilità d'uso percepita; Intenzione di utilizzare l'm-learning; Interattività percepita; Percezione dell'utilità; Soddisfazione; Studenti universitari.

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