Technology Readiness During the COVID-19 Pandemic: Lessons Learned from Indonesia

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***Abstract*—The COVID-19 pandemic since March 2020 has forced Indonesians to practice physical distancing and carry out their personal and professional activities from home. However, not everyone is ready to conduct their regular activities remotely. The issue is the readiness for digital technology. The research aims to analyze the Indonesian people's readiness for digital technology during the pandemic. The research also investigates the impact of optimism and technology adoption on behavioral intention mediated by perceived ease of use. The research applies a quantitative study using an online questionnaire. The population of the research is people who use Internet technology for online learning, working from home, online shopping, and social activities during the COVID-19 pandemic. The research successfully gathered 327 respondents using purposive sampling. The research uses Structural Equation Model (SEM) method via SPSS AMOS software to analyze the data and generate findings. There are several findings. First, optimism has a positive relationship with perceived ease of use. Second, technology adoption relates with perceived ease of use positively. Third, perceived ease of use has a positive relationship with behavioral intention. Last, the empirical evidence for the mediation roles of perceived ease of use is inconclusive. The research also offers some managerial implications.**

***Index Terms*—Technology Readiness, COVID-19 Pandemic, Digital Technology**

I. Introduction

THE COVID-19 pandemic started in Wuhan, China, at the end of December 2019 [1, 2]. The pandemic began to spread in Indonesia in March 2020 [2]. The ongoing pandemic conditions and the increasing number of infected have made the government carry out various policies to limit physical interactions, such as studying and working from home [3]. The habit of studying and working from home is accompanied by other activities, such as online shopping. During the COVID-19 pandemic, McKinsey notes several changes, including a 15–35% increase in online shopping in almost all categories [4]. According to Markplus, 34% of consumers buy digital products [5]. Meanwhile, Deloitte concludes that 50% of consumers use digital payments [6].

Previous research concludes that using technology necessitates technological readiness, particularly during COVID-19 in the context of G20 countries [7], Indonesia [**?**], Pakistan [9], and the United States of America [10]. In the context of education, it is found that the unexpected pandemic condition leaves university educators unprepared [3]. Teachers are expected to teach while learning using technology simultaneously, such as Zoom, Google Meet, Moodle, Skype, and so on [3, 11]. Meanwhile, students have difficulty learning online because they have limited digital facilities and knowledge [12], their Internet connections are poor, and they are unable to use technology devices [13], especially those in remote areas. In terms of work, not all employees who work from home are knowledgeable about new technology, so what occurs is learning while working [14]. Likewise, in carrying out shopping activities, the older generation has problems [15]. Unpreparedness to use technology may cause anxiety, stress, and pain [16].

Technology readiness is the propensity to embrace and use new technology to achieve personal and professional goals, such as studying and working from home [3, 14]. Previous research suggests that readiness to use technology must be accompanied by optimism [3, 17, 18] to have the desire to learn and discover more. Furthermore, the rapid development of technology necessitates people's ability to adapt to

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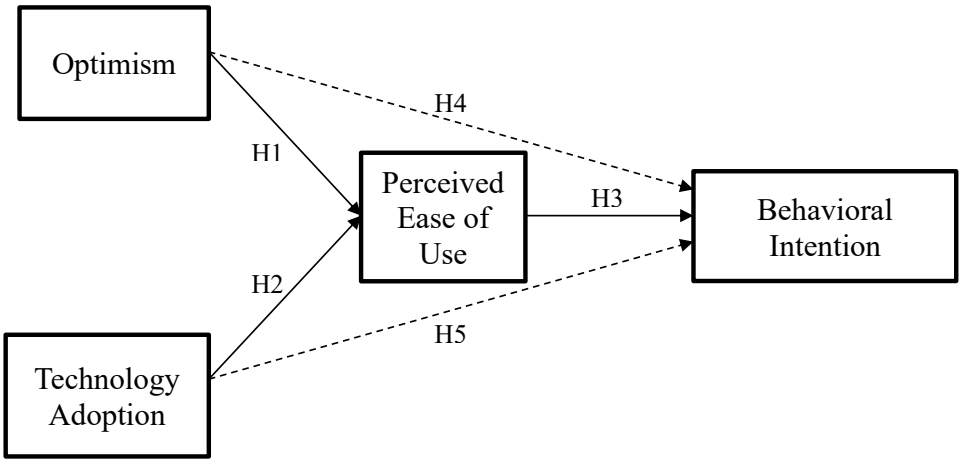

Fig. 1. Research Model.

new technology [17, 19]. The perceived ease of use of new technology may influence one's willingness to learn and adopt it [20]. Based on the description mentioned, optimism and technology adoption are the independent variables. Perceived ease of use is the intervening variable. Meanwhile, behavioral intention is a dependent variable.

The purpose of the research is to investigate Indonesians' readiness for digital technology during the pandemic. The uniqueness of the research is that respondents are from three generations: generation Z, millennials, and generation X. In addition, the research is conducted during the COVID-19 pandemic where due to physical restrictions, many activities, such as studying, working, and shopping, are carried out from home using digital technology. The theoretical framework of the research can be seen in Fig. 1.

A. Optimism

During the COVID-19 pandemic, optimism has a significant impact on the use of technology, particularly social media platforms [21]. In the context of technology, optimism is a sense of assurance in one's ability to use technology [22]. Optimism in technology in the context of learning makes students more productive, active in learning, and engaged in social interactions with their peers. So, this condition leads to greater academic success [3]. Additionally, employees who are optimistic about the use of technology at work can adapt and show better work performance and be more committed to their jobs [23]. It can be concluded that optimistic people generally think that everything will turn out well or according to their expectations.

An optimist also welcomes new technologies. In a way, optimists are users of new technologies. They have a positive attitude and spread positive words about new technologies. Previous researchers assume that an optimist perceives new technology as useful and easy to use because they are not afraid of its adverse implications [24]. Optimism has the strongest impact on the perceived ease of use of technology. Optimist people are more accepting of new technology and less likely to be concerned about its negative implications [24]. Similar conclusions also come from previous research [14, 17]. Therefore, the first is as follows.

> H1: Optimism has a positive relationship with perceived ease of use.

B. Technology Adoption

Technology adoption is related to the tendency of people to embody and utilize new technologies to achieve personal or professional goals at home and work [16]. In general, it is one's mental readiness to adopt new technologies despite their costs or challenges. One aspect of assessing technology adoption is how the technology interacts smoothly and is expected by users [25]. Additionally, technology adoption has five dimensions: optimism, innovation, and discomfort. The parameters of technological readiness, optimism, and innovation are "contributors" that can increase readiness to use technology. However, the other two parameters, discomfort and insecurity, are considered "barriers" that can suppress the level of readiness to use the technology [16].

Technology readiness relates to consumers' perceived ease of use when using new technology, affecting their intention to use it [26]. The research, as mentioned earlier, also proves that perceived use

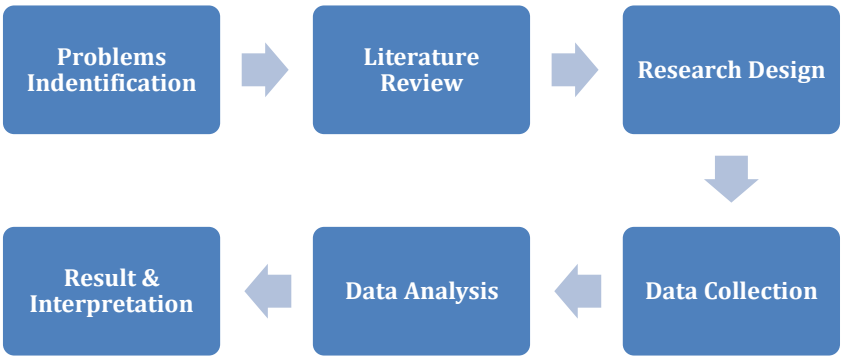

Fig. 2. Research Steps.

mediates the relationship between technology and customers' intention to adopt new technology. Therefore, the second hypothesis is as follows.

H2: Technology adoption has a positive relationship with perceived ease of use.

C. Behavioral Intention

Technology Acceptance Model (TAM) forecasts attitudes, willingness, and behaviors toward new technologies. Furthermore, this model identifies the differences in people's readiness to employ information technology [26]. According to the TAM, behavioral intentions influence system use. For example, the confidence of the users, which includes perceived ease of use and perceived usefulness of the system, is a factor that influences intention. Moreover, digital technology may be too complicated and time-consuming for more mature groups, like the elderly. Hence, they are less interested in embracing it [27]. Meanwhile, the younger generation is quick to adapt to new technology, with millennials dominating digital technology [28].

According to TAM, there is a positive relationship between attitudes and willingness to use the system when technology is perceived as simple to use and beneficial to users. Then, it leads to these technologies' acceptance and actual use [29].

D. Perceived Ease of Use

Technology usage in daily life is related to how beneficial it is regarded to be, specifically how easy it is to use. Perceived ease of use refers to a person's attitude toward new technology, which influences their behavioral intentions toward the technology. Perceived ease of use is described as the degree to which a potential user expects the new technological know-how to be free of effort [30]. Perceived ease of use will lead to a desire to conduct transactions via mobile payment [26]. Adoption of technology refers to an individual's attitude toward using technology that is deemed useful to them [31]. Several previous studies have found a positive relationship between perceived benefits and ease of use of technology [21, 32**?**]. Therefore, the last hypotheses are as follows.

H3: Perceived ease of use has a positive relationship with behavioral intention.

H4: Perceived ease of use positively mediates the relationship between optimism and behavioral intention.

H5: Perceived ease of use positively mediates the relationship between technology adoption and behavioral intention.

II. Research Method

The research applies a quantitative study using descriptive analysis. Researchers investigate the impact of optimism and technology adoption on behavioral intention mediated by perceived ease of use. Figure 2 depicts the stages of the research. It includes identifying the problem, searching for supporting literature, and designing the research by selecting and processing data collection tools. The data are collected using a questionnaire and analyzed using Structural Equation Model (SEM). Finally, the statistical results are interpreted and concluded.

Online questionnaires are used to collect the data. Respondents choose five alternative answers from the Likert scale: Strongly Disagree, Disagree, Neutral, Agree, and Strongly Agree. The questionnaire includes four measurement scales based on previous studies. The seven items of optimism, technology adoption, and perceived ease of use are adapted from previous studies [17, 24, 33], respectively. Similarly, the eight behavioral intention items are adopted from the previous study [34].

The population is people who use Internet technology for online studying, working, shopping, social

TABLE I
RESPONDENTS' PROFILES IN THE RESEARCH.

Indicator		N	%
Gender	Female	117	35.80
	Male	210	64.20
Age	17–21 (Gen Z)	122	37.31
	22–38 (Millennials)	131	40.06
	38–54 (Gen X)	74	22.63
Education	College Degrees	130	39.76
	Non-College Degrees	197	60.24
Occupation	Student	125	38.23
	Employee	146	44.65
	Entrepreneurs	31	9.48
	Others	25	7.64

activities, meetings, and other activities during the COVID-19 pandemic. The research employs purposive sampling and collects 327 respondents. The data are analyzed using SEM via SPSS Amos software. The analysis begins by measuring the reliability of the measurement scales and their internal consistency, namely Cronbach's alpha (> 0.7) and Average Variance Extracted (AVE) score (> 0.5). The research also performs Exploratory Factor Analysis (EFA), such as Kaiser-Meyer-Olkin (KMO) and Barlett's test (0–1) and rotated component matrix (< 0.5). After all the requirements are met, the research evaluates the model fitness and runs the regression analysis to see if the statistical results support the hypothesis (< 0.05).

III. RESULTS AND DISCUSSION

A. Respondents' Profiles

Based on Table I, most of the respondents are male, with a total of 64.20%. Meanwhile, the rest are female, with 35.80%. In terms of age, the majority of the respondents belong to the millennial category aged 22-38 years at 40.06%. It is followed by Gen Z at 37.31% and Gen X at 22.63%. Meanwhile, based on education, it has two groups: a higher education background with 39.76% and non-university education with 60.24%. Employees dominate the category from the work aspect at 44.65%. It also has students at 38.25% and entrepreneurs at 9.48%. Then, the remaining 7.64% are housewives, part-timers, and retirees.

B. Measurement

Cronbach's alpha measures the reliability of the number of items used in the research to determine internal consistency. It has good internal consistency if Cronbach's alpha is bigger than 0.70 [35]. In Table II, the indicators used for each variable are described. The results are as follows. First, seven optimism items assess the extent to which respondents believe new technology is more useful, flexible, and efficient and increases the ability to control work/tasks. This construct shows good internal consistency in the samples used (Cronbach's α= 0.832).

Second, seven items of technology adoption examine the respondents' ability to adapt to technology during a pandemic. It includes the ability to complete tasks/-work from home, keep up with technological developments, and use technology for activities, such as collaborating with teams, socializing, and transacting. Again, this construct shows good internal consistency in this sample (Cronbach's α= 0.787).

Third, seven items of perceived ease of use see the respondents' mindset level of readiness to accept new technology with all its consequences. It includes a willingness to learn, ultimately bringing ease and speed in working/completing tasks. This construct also shows good internal consistency in this sample (Cronbach's α= 0.863).

Fourth, the behavioral intention measurement scale consists of eight items. Those are related to interest in the use of technology, opinions about the use of technology during the pandemic, and habit of using technology in everyday life. This construct also has a good internal consistency in this sample (Cronbach's α= 0.881).

The Average Variance Extracted (AVE) measures the amount of variance in a construct. Table III indicates that the AVE of each factor is higher than 0.5. The results are desirable.

C. Factor Analysis

The KMO index ranges from 0 to 1. A value of 0.50 is considered suitable for factor analysis [2]. Based on Table IV, the KMO is 0.906. The result indicates that the sample is sufficient for factor analysis.

However, another previous research argues that confirmatory factor analysis aims to evaluate the relationship patterns between several constructs. Each construct is built by indicators [36]. Table V shows the total variance explained by the four factors. A total variance of 60% or higher and a greater Eigenvalue than 1 are preferred in factor analysis.

Communality values less than 0.5 should be removed [35]. Next, as shown in Table VI, items of OT3, OT4, OT6, and OT7 are removed from the optimism construct. Similarly, TA1, TA2, TA6, and TA7 are cut from the technology adoption construct. Then, the research also eliminates items of PU2, PU3, PU4, and PU6 from the perceived ease of use construct. Finally, BI5, BI6, BI7, and BI8 are also removed from the behavioral intention construct. The rest items are used in the following process.

TABLE II
THE RESULTS OF MEASUREMENTS USING CRONBACH'S ALPHA.

Variables	Items	Measurements	Cronbach's Alpha
Optimism (OT)	1. I feel my life is getting better because of the digital technology during the COVID-19 pandemic. 2. I feel digital technology has made my mobility easier during the COVID-19 pandemic. 3. Digital technology makes my life more productive during the COVID-19 pandemic. 4. Because of digital technology, I think people can manage their daily lives more easily during the COVID-19 pandemic. 5. Because of digital technology, I feel that I can finish my tasks more effective and efficient during the COVID-19 pandemic. 6. I can easily interact with people because of digital technology during the COVID-19 pandemic. 7. I believe that if I learn, I will be able to use the new application.	5-Point Likert Scale (1= Strongly Disagree; 5= Strongly Agree)	0.832
Technology Adoption (TA)	1. I prefer to try or use the available digital technology. 2. I find that the newest technology stimulates my mentality during the COVID-19 pandemic. 3. I like the technology because it can calibrate my needs. 4. I enjoy the digital technology challenge. 5. I keep up with the digital technology development. 6. Products and services that utilize the digital technologies are more convenient to be used during the COVID-19 pandemic. 7. I find it easier to collaborate with my relatives using digital technology during the COVID-19 pandemic.	5-Point Likert Scale (1= Strongly Disagree; 5= Strongly Agree)	0.787
Perceived Ease of Use (PU)	1. Using the advance of technology can increase my productivity during the COVID-19 pandemic. 2. I find it easy to recover from errors encountered while using the technology during the COVID-19 pandemic. 3. It is easy for me to remember how to run digital technology during the COVID-19 pandemic. 4. Using digital technology makes it easier to do my job during the COVID-19 pandemic. 5. Using digital technology can improve my quality of work. 6. I find digital technology easy to use during the COVID-19 pandemic. 7. Digital technology supports my social interaction.	5-Point Likert Scale (1= Strongly Disagree; 5= Strongly Agree)	0.863
Behavioral Intention (BI)	1. I feel positive about using digital technology during the COVID-19 pandemic. 2. Using digital technology is a good idea during the COVID-19 pandemic. 3. Using digital technology is beneficial for me during the COVID-19 pandemic. 4. After all things are considered, using digital technology is beneficial for me during the COVID-19 pandemic. 5. During the COVID-19 pandemic, I am addicted to use digital technology. 6. During the COVID-19 pandemic, the use of digital technology becomes habit for me. 7. I intent to continue using digital technology for finishing my assignments frequently. 8. I will always use the digital technology for my daily life.	5-Point Likert Scale (1= Strongly Disagree; 5= Strongly Agree)	0.881

TABLE III
THE RESULTS OF AVERAGE VARIANCE EXTRACTED.

Factors	AVE
Optimism	0.519
Technology Adoption	0.544
Perceived Ease of Use	0.518
Behavioral Intention	0.578

TABLE IV
THE RESULTS OF KAISER-MEYER-OLKIN (KMO) AND BARTLETT'S TEST.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.906
Bartlett's Test of Sphericity	Approx. Chi-Square	1757.971
	Df	78.000
	Sig.	0.000

TABLE V
THE RESULTS OF TOTAL VARIANCE EXPLAINED.

Com	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Var	% of Cum	Total	% of Var	% of Cum
1	5.720	43.998	43.998	2.936	22.585	22.585
2	1.289	9.915	53.913	2.050	15.767	38.352
3	0.983	7.563	61.476	1.999	15.377	53.729
4	0.882	6.785	68.262	1.889	14.533	68.262

Note: Com= Component, Cum= Cummulative, and Var= Variance.

TABLE VI
ROTATED COMPONENT MATRIX IN THE RESEARCH.

	Component			
	1	2	3	4
OT1			0.798	
OT2			0.813	
OT5			0.510	
TA3				0.577
TA4				0.832
TA5				0.779
PU1		0.716		
PU5		0.662		
PU7		0.777		
BI1	0.695			
BI2	0.847			
BI3	0.731			
BI4	0.761			

Note: Optimism (OT), Technology Adoption (TA), Perceived Ease of Use (PU), and Behavioral Intention (BI).

TABLE VII
THE RESULTS OF MODEL FITNESS.

	Recommended Threshold	Result	Note
Root Mean Square Error of Approximation (RMSEA)	< 0.07	0.059	Good Fit
Standardized Root Mean Square Residual (SRMR)	< 0.08	0.043	Good Fit
Goodness of Fit (GFI)	> 0.95	0.945	Moderate Fit
Adjusted Goodness of Fit Index (AGFI)	> 0.95	0.916	Moderate Fit
Normed Fit Index (NFI)	> 0.95	0.929	Moderate Fit
Tucker–Lewis Index (TLI)	> 0.95	0.948	Moderate Fit
Comparative Fit Index (CFI)	> 0.95	0.961	Good Fit

TABLE VIII
THE RESULTS OF REGRESSION WEIGHTS.

	Esti -mate	Standard Error (SE)	Composite Reliability (CR)	Signifi -cance (P)
Optimism → Perceived Ease of Use	0.603	0.112	5.362	0.000
Technology Adoption → Perceived Ease of Use	0.427	0.100	4.266	0.000
Perceived Ease of Use → Behavioral Intention	0.234	0.119	1.976	0.048

TABLE IX
THE RESULTS OF MEDIATION ANALYSIS.

	Test Statistic	Standard Error (SE)	Signifi -cance (P)
Optimism → Perceived Ease of Use → Behavioral Intention	1.847	0.076	0.076
Technology Adoption → Perceived Ease of Use → Behavioral Intention	1.786	0.056	0.056

D. Structural Equation Modelling

The final SEM results are presented in Fig. 3. There are two exogenous variables (optimism (OT) and technology adoption (TA)), one mediator/intervening variable (perceived ease of use (PU)), and one endogenous variable (behavioral intention (BI)). The Squared Multiple Correlation (R^2) of perceived ease of use is 67.4%. Meanwhile, the R^2 of behavioral intention is 68.9%.

The next step is to compare the model fit suitability indicator values with the threshold [37]. Table VII shows that the proposed SEM model has a moderate fit. Hence, it can be continued to the next process.

Table VIII presents the regression weight of the SEM Model. The results show that the research can support the previously mentioned hypotheses. H1, H2 and H3 are accepted because their significance values are less than 0.05. First, optimism and technology adoption have a positive relationship with perceived ease of use. Second, perceived ease of use has a positive relationship with behavioral intention.

Next, the researchers also conduct the mediation analysis using the Sobel test. Table IX shows that H4 and H5 cannot be supported (Sig. > 0.05). It means that perceived ease of use purely acts as an intervening variable.

E. Discussions

Technology readiness is intimately linked to the concepts of self-efficacy and self-confidence, particularly how individuals' optimism can influence their acceptance of technology in their daily life [17]. More-

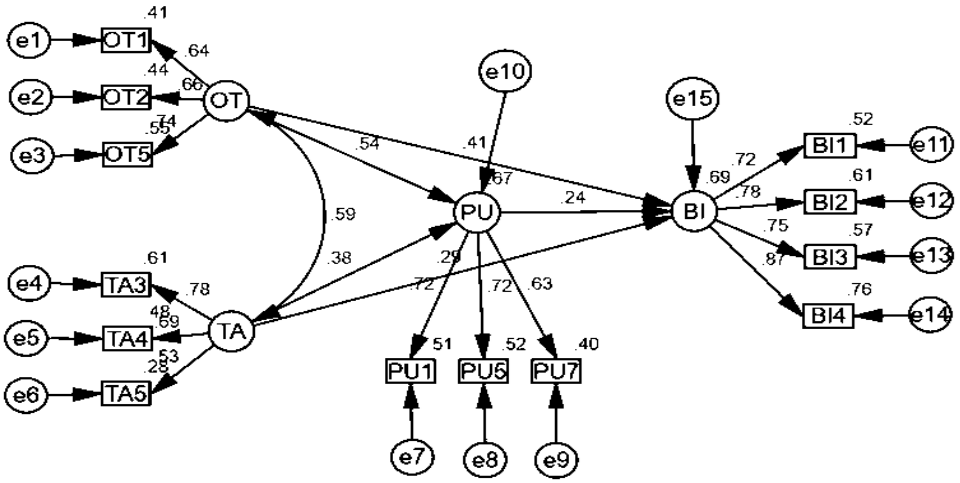

Fig. 3. Structural Equation Model (SEM) in the research.

over, in the pandemic, digital technological readiness is required for studying, working, meeting, socializing, shopping, and other activities that can be done from home.

The findings support the first hypothesis (H1) that optimism positively correlates with perceived ease of use. When respondents have confidence in their ability to use technology, they encounter no difficulties in using digital technology. The results are in line with the previous research [14, 17]. In the context of learning from home, optimism is one of the most crucial factors in gaining a thorough understanding of the technology [18]. Confidence also applies to working from home [38] and doing other daily activities, such as socializing, shopping, and transacting [15]. Students, employees, entrepreneurs, and housewives may need optimism training to be ready to use technology [21]. Meanwhile, family members or close friends who assist in the usage of technology boost a user's optimism [39].

Next, the research empirically proves that technology adoption has a positive relationship with perceived ease of use (H2). Adaptation in technology allows a person to feel more at ease with technology because of the ability to follow developments, the desire to change for the better, and the search for relevant information [14, 17]. Previous research reaches a similar conclusion when examining the differences in technology adoption between men and women, finding that men are more adaptable to new technologies than women [40]. However, regardless the gender, technology adoption has a positive relationship with perceived ease of use. Moreover, generation Z is the easiest generation to adopt technology [28]. Therefore, working with this generation to assist families and the surrounding environment in adopting the technology will result in readiness to use technology.

Then, the results also support the third hypothesis (H3) that perceived ease of use has a positive relationship with behavioral intention. The high perceived ease of use encourages a person to use the technology. Thus, a positive perception leads to a desire to use technology [41]. Constraints on the readiness to use technology during the pandemic are experienced by students, especially those who live in remote areas and have economic limitations. Hence, they are unable to buy supporting equipment and pay Internet fees [12, 13]. Meanwhile, employees with limited technical know-how are not ready for sudden changes due to a pandemic, which forces them to work from home [14]. This condition causes stress at work and results in subpar work results. The role of schools, businesses, and communities in assisting students in understanding the use of digital technology will foster a desire to practice and learn how to use it [39].

The research result cannot support the fourth hypothesis (H4). The result suggests that perceived ease of use does not mediate the relationship between optimism and behavioral intention. The result is contrary to the previous study [17]. Optimistic respondents are expected to have positive behavior and feel it is easier to use new technology. Optimism toward new technology is useful during the COVID-19 pandemic. Based on the Theory of Plan Behavior [42], optimism and perceived ease of use in the context of technology encourage people to use digital technology to complete work from home, attend online lessons, and do other online tasks. Peer support and training in new technology also increase motivation to use technology by preparing them psychologically to compete with technological

changes [38, 41].

Last, the research result also cannot support the fifth hypothesis (H5). The result suggests that perceived ease of use does not mediate the relationship between technology adoption and behavioral intention. The result is contrary to the previous study [16] which demonstrates that the ability to adapt to new technologies results in a positive attitude toward the technologies and ultimately influences one's behavioral intention. Moreover, it is discovered that the younger generation (generation Z and millennials) adapt to technology more easily than the older respondents (generation X). The educational background also has an impact on technology readiness. Respondents with a college education are more likely to adopt technology than those without a college education. Ready or not, pandemic conditions necessitate everyone who studies, works, or performs activities from home to be prepared to use new technologies.

IV. Conclusion

Technology readiness enables everyone to learn how to use technology quickly, allowing them to study, work, and do activities from home. However, a lack of facilities, limited Internet access, and a lack of technological know-how all play a role in technological readiness. The research focuses on technological readiness during the COVID-19 pandemic. The theoretical contribution of the research is that individuals' readiness to use technology must be supported by optimism because self-confidence motivates everyone to act and adapt to digital technology in everyday life. Furthermore, the stereotype that a person's age causes them to stammer in technology must be dispelled because age does not affect learning. This condition must be supported by the ease of use of digital technology to increase the intention to use it.

The first managerial implication of the research is for the government of the Republic of Indonesia, especially the Ministry of Education. Students and educators' readiness to use technology can be supported by providing online training and involving campuses/schools with better digital technology capabilities. Moreover, every village hall in the country can be equipped with the necessary technological facilities, such as free Wi-Fi and computers, to facilitate learning and teaching. The provision of Internet vouchers by the Ministry of Education since September 2020 is a positive incentive for students and educators to engage in online learning. However, evaluation is still needed because not all students and educators need this assistance, especially in well-known private schools that have provided these facilities.

Second, businesses can help employees by providing regular training whenever new digital technology is introduced. Credit facilities, allowances for Wi-Fi credit, and the ability to borrow office equipment, such as laptops, will make it simpler for workers who work from home to meet their work goals. After the pandemic, if working from home is proven to increase employee productivity, this alternative may become a business policy for various jobs.

There are several limitations in the research. First, the small number of respondents limits the ability to represent the preparedness of digital technology in all of Indonesia's regions. Secondly, the research makes no distinction between students, employees, entrepreneurs, or other types of workers regarding technical readiness. Hence, future research can expand the research by splitting the research area, such as urban and rural areas. Then, future research can employ mixed methods to collect data that are not only quantitative but also qualitative using in-depth interview instruments. Other socio-cultural variables will also contribute to the understanding of this topic.

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