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The Influence of Trust, Health Beliefs, and Technology Acceptance on The Intent to use an Mhealth in Indonesia: An Empirical Study of Users and Non-Users

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Abstract. Mobile Health (mHealth) use is expected to promote public health and has been viewed as a possible solution for the management of the COVID-19 outbreak since 2020. However, the use of m-heath in those countries, including Indonesia, is not as expected, probably due to low acceptance and willingness to use mHealth. This study observed the influence of trust, health belief, and technology acceptance on the intention to use mHealth in Indonesia for both users and non-users. A total of 616 respondents, with a balanced number of users and non-users of mHealth, voluntarily participated in this study by filling out a questionnaire. The questionnaire was developed based on a conceptual model integrating trust, health belief model, and technology acceptance. A total of 34 questions were administered based on the conceptual model. A five-Likert scale was used to measure the answers. Interesting findings showed that among the non-users of mHealth, perceived usefulness influenced the intention to use mHealth more than that among those who actually used the technology. Among the users of mHealth, perceived ease of use influenced the intention to use the technology more than that among the non-users. The effect of trust was not shown to be significant. In general, intention to use mHealth in Indonesia was significantly influenced by perceived usefulness, perceived ease of use, and perceived health risk.

Keywords: Acceptance; Health belief; Indonesia; mHealth; Trust

1. Introduction

COVID-19 has become an international issue since 2020. In managing and overcoming the further spread of infectious disease outbreaks, especially in relation to the need to maintain social stability, hoaxes, and disinformation have played a detrimental role (Berawi, 2020). The use of mobile health (mHealth) technologies has the potential to promote public health and has been viewed as a possible solution for the management of the COVID-19 outbreak (Asadzadeh and Kalankesh, 2021). Mobile health, often called mHealth, can be defined as "medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants

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(PDAs), and other wireless devices" (WHO, 2011). MHealth is viewed as a component of electronic health (eHealth). eHealth is defined as the cost-effective and secure use of information communication technologies (ICT) in support of health and health-related fields, including healthcare services, health surveillance, health literature, and health education, knowledge, and research (NIHP, 2010). The difference between the two concepts lies in the focused use of mobile applications in mHealth, whereas e-health utilizes a wider range of devices using ICT for health purposes, not necessarily only via mobile applications.

According to the World Health Organization (WHO), mHealth service includes communications between individuals and health service providers (for example, healthcare call centers), communication between health service providers and individuals (e.g., health promotion campaigns), consultation between health care professionals and patients (Mobile telehealth), health monitoring and surveillance (e.g., health surveys), and access to information and education for health care professionals (e.g., electronic patient information) (WHO, 2011) Globally, some of the most widely utilized forms of mHealth include health care telephone helplines, emergency toll-free telephone services, and mobile telemedicine.

Indonesia is one of the developing countries with recent high concerns regarding mHealth use. The Indonesian government through the Ministry Health of the Republic of Indonesia (2012) concerning Roadmap for Action Plans for Strengthening Indonesia's Health Information System, underlined the importance of the effort to increase e-health and mHealth use (Ministry Health of the Republic of Indonesia, 2012).

MHealth use in Indonesia has been growing very rapidly. Handayani *et al.* (2018) show the critical success factors in the implementation mHealth in Indonesia. However, the implementation of mHealth in Indonesia has not been optimal due to various obstacles. As stated in several reports and research studies, the success of mHealth is determined not only by the information and communication technology (ICT) infrastructure but also by stakeholders such as local governments, health agencies, health workers, and also the community or the user (Nugraha and Aknuranda, 2018). The Indonesian government, in this case, has been investing in improving the ICT infrastructure as well as empowering healthcare agencies and healthcare workers to optimize the use of mHealth.

The community, users, or patients, in this case, are crucial stakeholders who play a vital role in the success of eHealth and mHealth initiatives in Indonesia. Though some research has investigated the role of users in mHealth use, unfortunately, there are very limited studies on mHealth use from the perspective of users in Indonesia. An exception was a study (Nugraha and Aknuranda, 2018), which provided an overview of e-health in Indonesia and underlined the importance of considering the user in its success.

Consideration of the user in the use of such technology or products has been investigated in some areas in Indonesia, such as in the use of e-commerce, e-books, and financial technology (Purwanegara, Apriningsih, and Andika, 2014). Recognizing the acceptance of technology by individuals is the beginning stage of any product or technology, and mHealth is no different. Acceptance, in general, can be defined as the favorable decision to adopt and utilize an innovation.

There are theories relating to the acceptance of technology, and among the most used model is the Technology Acceptance Model (TAM) by Davis (Holden and Karsh, 2010). The TAM consists of perceived ease of use (defined as the belief that the technology requires minimal effort to use) and perceived usefulness (defined as the belief that how using the technology will bring benefits to the user), and attitude toward technology use. Perceived usefulness and perceived ease of use both affect attitudes toward using the technology,

which in turn influence the behavioral intention to adopt the technology. In relation to mHealth, technology acceptance has been proven as a factor that determines the successful adoption of mHealth in several countries (Birkmeyer, Wirtz, and Langer, 2021; Rajak and Shaw, 2021; Sun *et al.,* 2016).

It is important to note that the TAM has been employed to examine the acceptance of mHealth as a component of Information Technology. However, considering that mHealth is related to healthcare, it is crucial to emphasize the theories used to explain health behavior. One of the most commonly utilized predictors of health behavior is the Health Belief Model (HBM). Studies have used the HBM perspective to explain health-related internet use via the subjective assessment of an individual's vulnerability to health risks and one's consciousness toward health (Ahadzadeh *et al.,* 2015). In the beginning, the HBM was developed to predict the behavioral reaction of individuals with acute or chronic diseases to the treatment they receive, but the model was later employed to predict more general health behavior. According to the HBM model, health information seeking can be influenced by perceived health risk (consisting of perceived susceptibility to disease, defined as the beliefs about the likelihood of getting a disease or condition, and perceived severity of disease, defined as the feelings about the seriousness of contracting an illness or of leaving it untreated, including evaluations of both medical and clinical consequences and possible social consequences) and health consciousness (defined as the degree to which health concerns are integrated into a person's daily activities).

Another factor that may play an important role in the success of mHealth use is trust. Trust can be defined as ""the belief that specific technology has the capability, functions, or features to do for one what one needs to be done"(Mcknight et al., 2010). Trust comes into play when there is uncertainty and a level of risk (Calnan and Rosemary, 2008). According to Hofstede, Indonesia scores 48 out of 100 on this dimension and thus has a low preference for avoiding uncertainty (Hofstede, 2005). The development of trust can be explained by moderating the effects of uncertainty avoidance (Schumann, 2008). People in low uncertainty avoidance cultures generally have a higher trust in the ability of other people, whereas people in high uncertainty avoidance cultures build trust based on a capability process, not the people. Trust is proven to influence the intention to use new information technologies such as e-government services (Carter and Bélanger, 2005), e-commerce (Palvia, 2009), mobile payment (Gao and Waechter, 2017), and financial technology (Candra, Nuruttarwiyah, and Hapsari, 2020). Trust has also been observed in the adoption and use of mHealth to some extent (Deng *et al.,* 2018; Akter, Ray, and Ambra, 2013).

When considering the acceptance of mHealth, it is important to differentiate between users and non-users. Previous studies show that there are different social attitudes between users and non-users of the Internet, in which Internet users are more tolerant of differences than non-users due to the premise that "going online" expresses openness to new experiences (Robinson and Martin, 2009) It was also stated that there is a difference in general health between users and non-users of the Internet (Schnell, Noack, and Torregroza, 2017) Since mHealth relates to Internet use, it is likely that users and non-users of mHealth show different behaviors.

This study aimed to observe the intention to use mHealth in Indonesia by integrating health beliefs, technology acceptance, and trust models. This paper used TAM as the framework in this study due to its simplicity in modeling basic constructs affecting the use of mHealth, such as study by Darmawan and Widyanti (2024) that used TAM to telemedicine acceptance model and Trapsilawati *et al.* (2019) that used TAM to eHealth acceptance model. Also, HBM is used in this study as it is the oldest and best-known model frequently used in behavioral health-related research and in predicting health-promoting

behavior in Indonesia (Caesaron *et al.,* 2021; Yastica *et al.,* 2020). Observing the intention to use mHealth is considered critical because its success depends on the user. Considering that technology acceptance and trust are culturally dependent, whereas health belief lies on the individual level. Therefore, assessing these factors in relation to the intent to use mHealth in Indonesia is crucial considering the fact that the Indonesian government will use mHealth to provide health services in rural areas and outer borders of the country with regards to MDGs. To observe the influencing factors, a survey was conducted using a questionnaire. The mHealth platform utilized in this study was Halodoc®, which belongs to the category of healthcare telephone helplines. The conceptual model for our present research is shown in Figure 1.

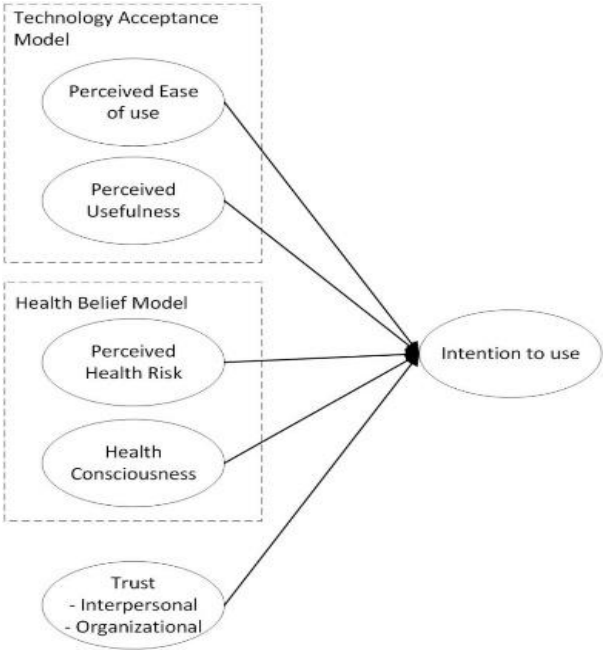

Figure 1 The conceptual model of intent to use mHealth in Indonesia

2. Methods

2.1. Respondents

A total of 616 respondents (mean age = 26.27 years, SD=9.68 years, 370 female) participated voluntarily in this study by filling out a questionnaire (the chosen respondents had the option to say "no" when asked to fill out the questionnaire). Purposive sampling was employed to select the respondents for this study, ensuring representation from both users and non-users of mHealth. For the non-users of mHealth, the surveyor provided an explanation of what mHealth entails and how to use it. Additionally, the non-user respondents were given the opportunity to try out the technology during the survey. The convenience method of sampling was also applied as respondents were selected because of their convenient accessibility and proximity to the researcher.

The paper-based survey was conducted in Bandung, Jogjakarta, and Surabaya. These three cities were chosen as representatives of big cities in Indonesia based on the Indonesian Statistical Bureau (BPS, 2009). Large cities were chosen because the use of the Internet, as well as mHealth in Indonesia, is mostly found in these areas. For small and medium cities as well as rural areas, the use of the Internet and the use of mHealth is quite low (Kominfo, 2021). Therefore, this present study focuses on big cities in Indonesia. In general, ten minutes were needed to complete the questionnaire. A compensation of $2 was provided to each respondent upon completing the questionnaire.

2.2. Questionnaire

A questionnaire was developed based on HBM, TAM, and trust and consisted of three questions in relation to perceived ease of use, three questions in relation to perceived usefulness, six questions in relation to perceived health risk, six questions related to trust, eight questions related to health consciousness, six questions in relation to trust, and four questions in relation to attitude toward use. In addition, the questionnaire inquired about the demographic data of the respondents.

All items were presented in Bahasa Indonesia, following the back-translation procedure (see Chen (2011) for further review). The back-translated version and the original English version were compared based on the content. The question items were presented with a 5 Likert scale ranging from 1 (strongly agree) to 5 (strongly disagree).

Preliminary testing was applied to a limited number of respondents (50 respondents) to evaluate the reliability and validity of the instrument. The questionnaire was tested for its reliability using Cronbach's alpha and for its validity using a correlation test. An obtained Cronbach's alpha score of >0.6 indicated reliable questions, but in some circumstances, a low value of alpha can still be acceptable (Bujang, Omar, and Baharum; 2018). The Corrected Item-Total Correlation value of > 0.3008 indicated valid questions. An additional question was given to the pilot respondents as to whether there were confusing or ambiguous questions that must be rephrased. No revision was needed based on the preliminary testing. Variable operationalization of the dimensions and constructs can be seen in Supplementary File.

2.3. Data Analysis

The questionnaire items and the model were analyzed using Structural Equation Modeling (SEM) using AMOS software. PLS-SEM was applied instead of other methods, such as covariate-based SEM. The reason for choosing PLS-SEM was that this study was a predictive study based on variance and nonparametric assumptions. A predictive study was used in this present study as the intention to use mHealth was predicted based on the construct variables. SEM was used to observe the relationship among variables based on the different statuses of users and non-users of mHealth.

3. Results

The median value of each construct for both users and non-users of mHealth can be seen in Supplementary File. Perceived ease of use and perceived usefulness among users are higher than among non-users, whereas the intention to use between the users and non-users is similar.

Loading factors for each item, as well as the construct reliability and Average Variance Extracted (AVE), can be seen in Table 1. All loading factors were higher than 0.4, with construct reliability more than 0.708 and AVE more than 0.5. These indicated that the model has internal consistency and validity.

The results of PLS-SEM can be seen in Supplementary File. These results showed that for both users and non-users of mHealth, factors that influence the intention to use mHealth were perceived ease of use, perceived usefulness, and perceived health risk. Interesting findings showed that among the non-users of mHealth, perceived usefulness influenced the intent to use mHealth more than that among the users. Among the users of mHealth, perceived ease of use influenced the intent to use mHealth more than that among the non-users.

Table 1 Loading factor (LF), construct reliability (CR), and AVE

Construct	Items	User			Non User		
		LF	CR	AVE	LF	CR	AVE
Health Consciousness	HC2	0.694	0.832	0.500	0.661	0.855	0.544
	HC3	0.554			0.722		
	HC4	0.746			0.844		
	HC5	0.726			0.797		
	HC8	0.793			0.645		
Perceived Health Risk	PHR7	0.780	0.899	0.689	0.830	0.920	0.742
	PHR8	0.863			0.893		
	PHR9	0.827			0.846		
	PHR10	0.848			0.875		
Perceived Ease of Use	PEU1	0.903	0.913	0.778	0.867	0.899	0.749
	PEU2	0.884			0.897		
	PEU3	0.859			0.831		
Perceived Usefulness	PU1	0.834	0.909	0.769	0.929	0.951	0.867
	PU2	0.911			0.937		
	PU3	0.885			0.928		
Trust (Interpersonal and Organizational)	T1	0.693	0.856	0.498	0.772	0.852	0.495
	T2	0.671			0.815		
	T3	0.711			0.797		
	T4	0.781			0.628		
	T5	0.693			0.543		
	T6	0.677			0.623		
Intention to Use	I1	0.878	0.920	0.741	0.894	0.931	0.773
	I2	0.843			0.884		
	I3	0.863			0.861		
	I4	0.858			0.877		

4. Discussion

This study aimed to observe the influence of health belief, technology acceptance, and trust on the intent to use mHealth in Indonesia. A survey in three large cities (Bandung, Jogjakarta, and Surabaya) was conducted to obtain the data. The results showed that significant factors that influenced the intent to use mHealth in Indonesia included perceived usefulness, perceived ease of use, and perceived health risk.

The constructs of perceived ease of use and perceived usefulness are higher among users than non-users. We understand this because, for the non-user, it is the first time they have used mHealth under the guidance of the surveyor. Surprisingly, the intention to use mHealth in Indonesia is similar (scale of 4 out of 5) for both users and non-users of mHealth. This result implies that after the first trial of mHealth, the non-users willingness to use mHealth is high, indicating the potential development of mHealth in Indonesia for the new user. However, it is important to note that the perceived usefulness among existing users may be lower since they have already recognized its usefulness and adopted mHealth for their needs. A separate model between users and non-users similarly showed that perceived usefulness, perceived ease of use, and perceived health risk influenced the intent to use mHealth.

As expected, the intent to use mHealth was influenced by the dimensions of the TAM (perceived usefulness and perceived ease of use). The obtained result was in line with expectations, as mHealth falls under the category of communication and information technology. In this context, the success of mHealth is indeed influenced by the acceptance of the user to adopt and utilize the technology effectively. This result is consistent with the results of the study (Deng *et al.*, 2018) that observed mHealth use in China.

TAM models how users come to accept and use technology. It has been continuously studied and expanded. We acknowledge that many newer models are available to explain the intention to use such new technology as mHealth. However, many newer models base their framework on TAM. We chose TAM as the framework in this study due to its simplicity in modeling basic constructs affecting the use of mHealth, as this study is the first to model mHealth acceptance in Indonesia. By knowing the basics, we would be able to extend the framework in future studies.

The fact that health behavior (including perceived health risk in this present study) influences the intention to use mHealth is also in line with the result of Ahadzadeh *et al.* (2015). Because mHealth is a technology correlated to individual health, the issue of health plays an important role in one's intention to use mHealth. The HBM is used in this study as it is the oldest and best-known model frequently used in behavioral health-related research and in predicting health-promoting behavior. Although there are newer health behavior models (such as the Transtheoretical Model), the HBM is still very relevant when discussing health behavior change. The HBM focuses on constructs that promote change as compared to the Transtheoretical Model, which focuses on the stages of attitude and belief— the antecedent in the ability to change. In this present study, knowledge about the constructs that promote change in the use of mHealth is of utmost importance.

In addition to TAM and HBM, the dimensions of trust were included in this study due to the fact that trust in the healthcare worker and the healthcare institution is crucial in the field of health and healthcare, as reported by several studies. The study conducted by (Whetten *et al.*, 2006) examined the role of trust in care providers and the government in relation to health service utilization. In relation to mHealth, a number of studies have examined the role of trust as a single and separate dimension that influences mHealth use (see Akter, Ray, and Ambra (2013) for an example). Most importantly, the issue of trust is a critical issue in developing countries. However, in this study, the influence of trust was found to be not significant. The absence of influence of trust might explain why although participants perceive mHealth to be useful and easy to use, the number of users is not maximal.

Mixed results were shown by various studies regarding the relationship between trust and the use of mHealth. Schnell, Noack, and Torregroza (2017) found that trust should be moderated by other factors to influence mHealth use. Akter, Ray, and Ambra (2013) also found that perceived trust will influence satisfaction toward mHealth use and its continuance. These previous studies support the result of the present study that trust did not directly influence the intention to use mHealth. It is likely that other factors may mediate or moderate trust and the intention to use mHealth.

Another possible explanation for the non-significant influence of trust in the intention to use mHealth is the cultural factor. In a cultural context, people in low uncertainty avoidance cultures, such as Indonesia, have a generally higher trust in the ability of other people (Hofstede, 2005). It implies that interpersonal trust is more important in these cultures. In this present study, the construct used was interpersonal and organizational trust. An additional separate analysis was conducted to observe the influence of interpersonal trust on the intent to use mHealth. Unfortunately, the analysis showed a non-significant influence of interpersonal trust on the intent to use mHealth. Thus, future studies considering other constructs or items that measure interpersonal trust might provide further explanation.

This study used multiple relevant concepts since mHealth is a relatively new technology involving many aspects specific to the health beliefs (i.e., health consciousness and perceived health risk) and trust of the potential user. Such aspects are important to the

patients seeking help through non-conservative methods. Patients who hold specific health beliefs typically seek engagement with doctors in clinics or hospitals, as these institutions are perceived as being more trustworthy. However, with the advent of new technologies, consultation methods could evolve, allowing patients to interact with healthcare professionals without the need for traditional face-to-face meetings within formal health institutions. The use of multiple concepts gives the possibility that some constructs might overlap and one construct can be influenced by another (i.e., as a covariate). In contrast, as stated by Stoica, Selén, and Li (2003), a single model has the potential to miss significant information or factors associated with other models that fit the data.

The results showing that perceived ease of use, perceived usefulness, and perceived health risk play an important role in the use of mHealth suggest an implication of mHealth adoption in Indonesia. The fact that perceived usefulness significantly and directly influenced the intention to use mHealth suggested an implication that the developers of mHealth must highlight the importance of a perception that mHealth is really useful for the user. In this case, the advantage of mHealth must be intensively introduced to Indonesian society, particularly in supporting MDGs. In relation to the perceived ease of use of mHealth, mHealth developers in Indonesia must underline the development of mHealth that is easy to learn, understand, and use. In relation to the perceived health risk and intention to use mHealth, the Indonesian government, and in particular, the Indonesian Ministry of Health, should take steps to enhance the awareness of Indonesians concerning their health conditions and health risk.

Concerning the different influences of perceived usefulness and perceived ease of use, this present study provides novel findings on the different behavior between users and non-users of mHealth. Compared to existing mHealth users, the non-user in this study was found to be more skeptical regarding the usefulness of mHealth. This finding suggests that the developer of mHealth and the Indonesian Ministry of Health may implement a different approach to enhance mHealth use among users and non-users of mHealth, in which emphasis should be given to increase the perceived usefulness for non-users and to increase the perceived ease of use for the users of mHealth.

This study has several limitations worth noting. First, only three large cities in Indonesia were involved. Enlarging the sample of respondents from other cities, particularly from small and medium cities as well as rural areas, might provide different results and different points of view. Second, the mHealth analysis was only conducted for Halodoc®, a widely used online consultation application in Indonesia. Studies on other mHealth platforms in Indonesia will enrich the analysis. Third, this present study was limited to the aspect of the intent to use mHealth. Issues related to the efficiency and effectiveness of Indonesian mHealth should also be taken into consideration, as the perceived ease of use has been proven to be important. Therefore, further studies, including a usability study (defined as a quality attribute that assesses the ease of use of user interfaces) are suggested to increase the use of mHealth in Indonesia. Fourth, the sampling method applied in this study is purposive convenience sampling. Considering other samples of the population will strengthen the internal validity of the results and analysis. Fifth, the instrument development is only based on a literature study. Justification from healthcare experts might increase the validity of the instrument to ensure that no multiple concepts are used (for example, health information and management).

Despite its limitations, this present study provides a novelty as the first study that integrates trust, health beliefs, and technology acceptance of mHealth. This study shows that the success factors of mHealth applications in Indonesia are perceived usefulness, perceived ease of use, and perceived health risk. In addition, this study is the first step to

understanding Indonesian behavior in relation to mHealth, which is important for providing better understanding and guidance for the Indonesian government in increasing and optimizing mHealth in Indonesia to realize MDGs, in particular in promoting public health and has been viewed as possible solutions for the management of the COVID-19 outbreak. Furthermore, mHealth can be used as one solution to develop smart cities in Indonesia as a smart healthcare which is among other smart city characteristics (Berawi, 2022). Further research on the use of mHealth among users and non-users in other developing countries should be conducted to generalize the results and analysis. Including other possible factors that might influence the intention to use mHealth will strengthen the body of literature on mHealth acceptance.

5. Conclusions

In this study, we found that intention to use mHealth in Indonesia was significantly influenced by perceived usefulness, perceived ease of use, and perceived health risk for both users and non-users of mHealth with the significant $\alpha = 0.05$. Interesting findings showed that among the non-users of mHealth, perceived usefulness influenced the intent to use mHealth more than that among the users. Among the users of mHealth, perceived ease of use influenced the intent to use mHealth more than that among the non-users. This study is important for providing better understanding and guidance for the Indonesian government in increasing and optimizing mHealth in Indonesia to realize MDGs, in particular in promoting public health and has been viewed as possible solutions for the management of the COVID-19 outbreak.

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