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An Evaluation of Community Adoption of the InaRISK BNPB Platform for Disaster Management: An Application of the Technology Acceptance Model (TAM)

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ABSTRACT

This study explores the community acceptance of the InaRISK BNPB platform, a novel approach to disaster management that integrates digital technology, Geographic Information Systems (GIS), and the Internet of Things (IoT). The Technology Acceptance Model (TAM) is utilized as a theoretical framework to decipher the acceptance patterns. Employing a quantitative research design, a survey methodology was adopted involving 47 participants, each over 18 years of age and having prior experience with the InaRISK BNPB platform. Data was collated from both primary and secondary sources. The primary data was gathered through questionnaires, while secondary data was obtained via an exhaustive literature review. The study implemented a quantitative descriptive analysis, alongside simple and multiple regression analyses for data interpretation. Findings suggest a significant impact of perceived ease of use on perceived usefulness, thereby influencing attitudes towards use and behavioral intentions to use the platform. Notably, attitude towards use was found to directly affect behavioral intention to use the platform. These findings underscore the salience of usability and intuitiveness in fostering technology acceptance. Consequently, it is imperative to enrich the features of InaRISK, making it not only more informative but also user-friendly, to bolster its adoption within the community. To augment the platform further, promoting transparency and information sharing across diverse sectors and stakeholders is deemed essential. This collaborative endeavor can enhance the quality and comprehensiveness of the information available on the InaRISK platform, thereby transforming it into an integrated disaster information hub. The potential contribution of this transformation to the advancement of digital IT-based disaster management is substantial.

1. INTRODUCTION

Indonesia, as articulated in global reports [1, 2], is situated among the countries bearing the highest disaster risks worldwide. The nation is frequently plagued by a diverse array of disasters, encompassing seismic phenomena (such as earthquakes and tsunamis), volcanic eruptions, and hydrological events (including floods and landslides). Several factors contribute to the amplification of disaster incidences in Indonesia, including its unique geological, geographical, and climatological positions, as well as socio-economic conditions and persistent environmental damage [3, 4]. Positioned at the convergence of the Eurasian Plate, the Indo-Australian Plate, and the Pacific Plate, Indonesia forms an integral part of the highly volatile Pacific Ring of Fire. This geologically active location, coupled with the country's tropical climate characterized by high rainfall and frequent climatic anomalies, intensifies the complexity of its disaster risk profile. Concurrently, Indonesia faces compounded challenges with rapid population growth, muted economic advancement, urbanization trends, and a prevalent tendency towards economic development, often overshadowing social and environmental considerations [5].

Given the heightened disaster risk, the prioritization of disaster risk reduction and the enhancement of disaster resilience within Indonesian society and its governmental structures have become paramount [6]. Disasters, as integral components of human existence, should not be underestimated, given that their impacts transcend individual and group levels, affecting the nation as a whole [7, 8]. Consequently, disaster risk reduction emerges as a crucial strategy for preemptive mitigation and expedited recovery post-disaster. The reduction and prevention of disasters can be achieved through the enhancement of the community's capability to mitigate hazards [9, 10].

In the context of the 21st century and the ongoing Industry 4.0 revolution, disaster risk reduction and community capacity enhancement necessitate an approach rooted in scientific and digital technology paradigms. Science and technology have been universally recognized as vital catalysts for promoting and implementing disaster risk reduction efforts, tracing back to the International Decade for Natural Disaster Reduction (IDNDR) in the 1990s, extending through the Hyogo Framework for Disaster Risk Reduction (HFA) from 2005 to 2015, and currently under the auspices of the Sendai Framework for Disaster Risk Reduction (SFDRR) from 2015 to 2030 [11]. The Sendai Framework, which spans from 2015 to 2030, underscores the need for all stakeholders to prioritize four critical areas: (1) Enhancing the understanding of disaster risk, (2) strengthening governance mechanisms for effective disaster risk management, (3) allocating resources to disaster risk reduction to fortify resilience, and (4) improving disaster preparedness for a more efficient response and the pursuit to "Build Back Better" during recovery, rehabilitation, and reconstruction phases [12]. Consequently, the role of technology in disaster risk reduction warrants emphasis, as advancements in technological innovation necessitate the adaptation and evolution of disaster management systems [13].

In the current epoch of the Fourth Industrial Revolution (Industry 4.0), opportunities abound for devising both structural and non-structural disaster management strategies. The industrial revolution, marked by digitalization and information technology advancements, facilitates swift, accessible, practical, efficient, and widespread information transfer, thereby possessing significant potential in aiding disaster risk reduction endeavors [14]. The strides made in digital information technology over the past decade have been instrumental for various disaster practitioners, including the realms of big data, the Internet of Things (IoT) [15, 16], Artificial Intelligence (AI), remote sensing, geospatial data [17], cloud computing, and social media communication [18, 19].

Indonesia, classified among the nations grappling with the most substantial disaster risks worldwide, has undeniably adopted digital technology as a strategic tool for risk mitigation. In the Indonesian context, the incorporation of technological advancements into disaster management predominantly initiates with the deployment of a Geographic Information System (GIS), serving as an essential mapping tool utilized by the National Disaster Management Agency (BNPB). In a step towards innovation, BNPB has developed a platform named InaRISK, accessible through a website (inarisk.bnpb.go.id) and a smartphone application. The InaRISK platform integrates digital technology, Geographic Information Systems (GIS), and the Internet of Things (IoT) in its operations, providing real-time access to various disaster data and information, including disaster risk, disaster events, and other pertinent information [20].

The InaRISK platform harbors significant potential to fortify disaster preparedness, particularly public knowledge pertaining to disaster risk and early warning systems. Nevertheless, initial surveys suggest a lack of public understanding regarding the platform's functionality, with its community utilization remaining minimal. Many individuals report unfamiliarity with the InaRISK platform and an absence of socialization regarding the platform. Predominantly, disaster-related information within the community is procured from social media or direct communication from relevant disaster stakeholders.

The availability of a robust disaster information platform is indispensable, as individuals require information about disaster risks to respond effectively [21]. Consequently, an analysis of the acceptance and utilization of the InaRISK platform within the community is crucial. The analysis aims to uncover community perspectives and assessments of the InaRISK platform, thereby offering a reference for stakeholders to undertake development and enhancement measures in terms of both platform quality and its community adoption frequency. This is particularly important given that disaster information platforms are infrequently used compared to social media [22] and are often relegated to times of crisis [23].

The acceptance and utilization of the InaRISK platform can be evaluated using the Technology Acceptance Model (TAM) approach, which is designed to assess information systems and elucidate how users accept and utilize a system [24]. As postulated by Davis [25], the Technology Acceptance Model (TAM) is primarily influenced by two pivotal factors that impact an individual's willingness to adopt a new technology: Perceived Ease of Use and Perceived Usefulness. Accordingly, this study aims to analyze the acceptance of the BNPB InaRISK platform in the community utilizing the Technology Acceptance Model (TAM). The study scrutinizes how individuals' attitudes towards using the InaRISK platform, as well as their intention to adopt it, are impacted by their perceived usefulness and ease of use. Additionally, the study investigates how attitudes towards usage influence the intention to utilize the InaRISK platform. Through this TAM analysis, the study anticipates providing evaluative insights for stakeholders to augment the effectiveness of the InaRISK platform, thereby enhancing its utility for diverse societal segments.

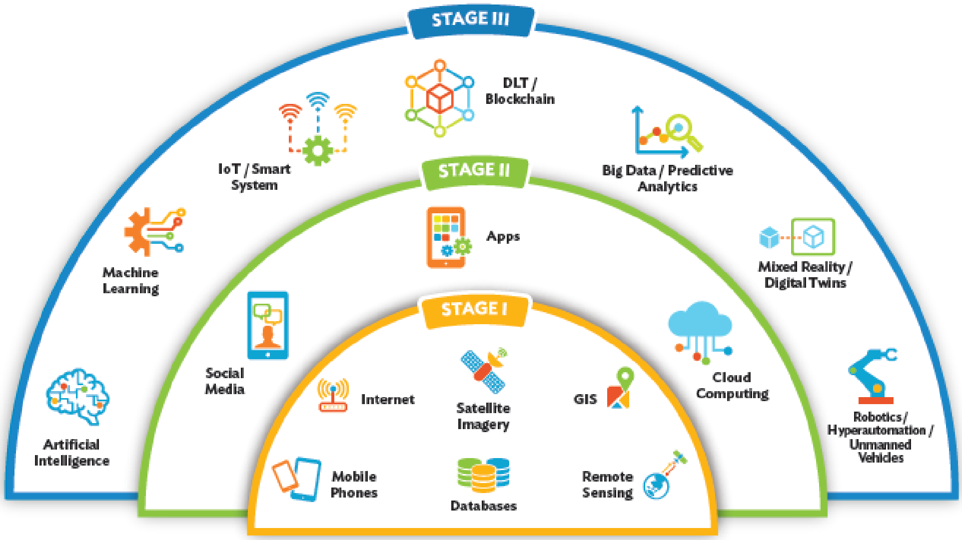
2. LITERATURE REVIEW

2.1 The role of digital technology in disaster risk reduction

Aligned with the Sendai Framework for Disaster Reduction 2015-2030, disaster risk reduction endeavors must underscore the pivotal role of science and technology. This technological arsenal encompasses remote sensing technology, Geographic Information Systems (GIS), Global Positioning System (GPS), satellite navigation systems, communication satellites, amateur radio, radio and television broadcasting, email, online data management, disaster information systems, and robotics. These technologies find widespread application in establishing Early Warning Systems, processing systems, and disaster analysis. Moreover, they are employed for tasks like constructing databases, integrating and analyzing information, creating disaster maps and conducting scenario simulations, assessing hazards and monitoring them, predicting disaster trends, evaluating vulnerability, facilitating emergency response decision-making, crafting disaster response plans, preparing logistics, and supporting Search and Rescue (SAR) teams [26].

Technology has a huge role in disaster risk reduction efforts, both at the preparedness stage, disaster mitigation stage, response stage, and recovery stage [26]. According to the United Nations [27], here are potential technologies associated with each stage of disaster management:

1. Mitigation - Focused on reducing disaster impact. Examples include building codes, zoning regulations, vulnerability analysis, and community education.
2. Preparedness - Involves planning for disaster response. Examples encompass preparedness plans, emergency response exercises, and early warning systems.
3. Response - Concentrated on minimizing disaster-related dangers. Examples include Search and Rescue (Robotic) operations, critical area mapping, and information management.
4. Recovery - Aimed at restoring the community to normal conditions. Examples comprise trauma healing, mapping, and planning for the reconstruction of various public facilities and settlements.



Source: Asian Development Bank [28]

Figure 1. The stages of digital technology in disaster management

The utilization of digital technology in disaster management can be categorized into three primary stages, each reflecting an increasing level of sophistication. The stages of digital technology adoption in disaster management are categorized as follows:

1. First Stage: This stage includes the utilization of databases, remote sensing, internet, satellite images and photos, mobile phones, GIS.
2. Second Stage: In this stage, there is an adoption of social media, smartphones, and cloud computing.
3. Third Stage: The third stage represents cutting-edge technologies such as advanced technologies such as Artificial Intelligence (AI), machine learning, deep learning, the Internet of Things (IoT) coupled with intelligent systems, distributed ledger technology including blockchain, harnessing Big Data for predictive analysis, immersive experiences through Virtual and Mixed Reality, Robotics, and Unmanned Vehicles [28]. These advanced technologies are at the forefront of disaster management.

These stages of digital technology adoption in disaster management are visually represented in Figure 1.

2.2 The significance of geographic information systems (GIS) in disaster risk reduction

In the initial stage of employing digital technology in disaster management, GIS and remote sensing stand out as pivotal technologies. Consequently, disaster management must confront challenges associated with data collection, data management, interpretation, integration, and communication. Hence, advancements in information technology, including remote sensing, communication satellites, and Geographic Information Systems (GIS), hold the potential to enhance the effectiveness of disaster management [29, 30].

Geographic Information Systems (GIS) can facilitate geographical exploration and inform spatial decision-making. GIS has the capability to narrate, process, and analyze spatial data sets from various sources and across different time spans. GIS can also perform modeling, simulation, and visualization of geospatial information, making it a foundational decision-making tool for stakeholders [31]. Hence, GIS emerges as a potent tool for analytical endeavors, given that each phase within the disaster management cycle is intricately connected in terms of geography and spatial relationships. GIS plays a significant role in spatial analysis to make it more accessible and adaptable, making it well-suited for disaster risk analysis and spatial planning [32].

In the disaster prevention and preparedness phase, one of the fundamental roles of GIS is to assess and map disaster-prone areas. GIS can also contribute to the assessment and mapping of disaster risk levels in various regions [33]. For example, a study by Assilzadeh et al. [34] used GIS to generate landslide hazard maps, maps of landslide-affected areas, landslide disaster risk maps, and emergency response maps for landslides. Another study by Oluwasegun [35] analyzed the role of GIS in mapping flood-prone areas. Additionally, in the prevention phase, GIS can serve multiple purposes, including the planning of evacuation routes, designing evacuation zones or locations, disseminating public information and involving the community, as well as creating scenario models to address hypothetical situations [36-40].

GIS can also be valuable in the aspect of disaster data management. GIS can serve as a data platform that allows integration with other alternative data systems. For example, GIS can display data about disaster phenomena such as landslides, floods, earthquakes, including their locations, frequencies, and intensities. Furthermore, GIS can showcase data about the surrounding conditions of the location during a disaster, such as its topography, geology, geophysics, soil composition, hydrology, land use, vegetation, and more. Moreover, GIS can present data about variables that could be affected or impacted during a disaster, such as infrastructure, settlements, demographics, and socio-economic knowledge [41]. A study by Cao et al. [42] also states that GIS integrated with building information modeling (BIM) is highly beneficial in various aspects of disaster management in urban areas.

During the response phase, GIS proves invaluable in various critical processes such as rescue operations, evacuation planning, medical services, food distribution, and shelter management. For example, GIS can be harnessed to establish networks and monitor its extension through web and mobile applications, which plays a pivotal role in supporting crisis managers to expedite their response efforts. Furthermore, GIS aids in the integration of data and information, addressing potential hurdles in the swift, accurate, and efficient distribution of aid [43]. Subsequently, in the recovery phase, GIS assumes a crucial role in restoring the crisis-affected areas to normal or even improved conditions. For instance, GIS is employed in mapping, data organization, spatial and 3D analysis, as well as geostatistical assessments to facilitate recovery efforts, including site selection for permanent housing and the restoration of essential services and infrastructure [44-46]. In addition, during the recovery phase, GIS assists in identifying areas suitable for reconstruction projects and recalibrating vulnerability models to enhance predictions of future disaster impacts [40]. It also aids in assessing disaster damages, conducting recovery analyses, designing disaster databases, and supporting risk education initiatives [37].

The pivotal role of GIS has spurred the development of numerous applications with location-based functionalities and map-centric disaster applications, serving as a platform for disseminating information, enhancing preparedness, and facilitating emergency response efforts [47]. The significant potential of GIS for the emergence of map and location-based disaster applications serves as one of the foundations for the development of the InaRISK Platform in Indonesia. InaRisk was developed and launched by the National Disaster Management Agency (BNPB). Inarisk is a disaster information platform that integrates digital technology, Geographic Information Systems (GIS), and the Internet of Things (IoT). InaRisk is capable of delivering real-time data and up-to-the-minute information on risk and disaster events, ensuring its constant updates. Some of the information available on the InaRisk platform includes information on types of disasters in each area, disaster maps, infographics on disaster vulnerability and disaster risk, disaster threats and hazards, government and population capacities, and population and other regional data that are closely related to disasters. InaRisk is able to provide disaster information up to district and city levels [20].

The InaRisk platform has much potential in helping to strengthen public disaster preparedness, especially aspects of risk knowledge and early warning systems. The community can learn all information in InaRisk to increase their knowledge of disaster risks around them. InaRISK can also function as an early warning system because it provides various preventive methods and steps to save themselves when a disaster occurs in an area [20].

Nevertheless, despite its potential, the utilization of InaRISK still needs to be further improved, as its current usage remains limited, and there needs to be more extensive research analyzing its effectiveness. Several studies have focused on the effectiveness of InaRISK's usage as an educational tool in schools, such as the study by Febrianto et al. [48] and Khusna et al. [49]. Subsequent research by Syaiful et al. [50] analyzed the application of InaRISK in educating about COVID-19 disaster mitigation. Furthermore, Diliawan's study [51] employed InaRISK to determine recommended locations for warning signs along the Cimandiri Fault lane. Another research conducted by Afisa et al. [52] examined the utilization of the InaRISK personal application for advancing disaster mitigation efforts in Indonesia and the associated challenges. The study's findings indicated that the information aspect of InaRISK obtained a score of 42%, indicating a good rating, followed by the communication aspect with a score of 31% and the coordination aspect with a score of only 26%. The results revealed that the InaRISK application had been downloaded and used by only a few individuals, mainly those residing in disaster-prone areas. Existing research highlights the necessity for analyzing user acceptance of the InaRISK platform with one approach utilizing the Technology Acceptance Model (TAM).

2.3 Technology acceptance model (TAM)

The Technology Acceptance Model (TAM) is a framework designed to illustrate users' intentions to accept and embrace new technology [53]. TAM is widely regarded as one of the most robust, effective, and influential models for elucidating user behavior in adopting systems or technology. Its primary aim is to forecast the acceptance of a system or technology and to pinpoint necessary adjustments for the system to gain user acceptance [24]. According to TAM, perceived usefulness and perceived ease of use stand as the primary determinants in the adoption of technology or systems within an organization. Consequently, these two determinants serve as the fundamental underpinnings for usage behavior and have implications for actual technology or system usage [54]. It's worth noting that the TAM model is versatile and adaptable, applicable across various fields of development, and can be augmented with additional variables to examine the factors influencing the adoption of new technology [55].

Perceived usefulness represents an individual's level of belief that a system will enhance their work performance. A system deemed useful is one that users perceive as having a positive impact on their performance. On the other hand, Perceived Ease of Use indicates a person's confidence in whether using a system will be straightforward and not entail significant effort. Users will more accept a system or application that is easy to use. So, according to the Technology Acceptance Model, a system or application, or technology will be more accepted by users if it has benefits that can be felt by users and are easy to use [25].

3. METHODS

3.1 Research design

The objective of this research is to assess the acceptance of the InaRISK BNPB platform within the community, utilizing the Technology Acceptance Model (TAM). This study utilizes a quantitative approach, employing a survey method and adopting the TAM framework as introduced by Davis [25], which encompasses two determinant variables and two dependent variables. In this study, the two determinant variables under analysis are perceived usefulness and ease of use. These variables were examined for their impact on users' attitudes toward using the InaRisk platform and their behavioral intention to use it. The study's design is illustrated in Figure 2 below.

3.2 Research hypothesis

The research hypotheses include the following:

1. H1: The Perceived Ease of Use variable will have an impact on the Perceived Usefulness variable.
2. H2: The Perceived Usefulness variable will influence the Attitude to Use variable.
3. H3: The Perceived Ease of Use variable will

influence the Attitude to Use variable.

4. H4: The Perceived Usefulness variable will impact the Behavior Intention to Use variable.
5. H5: The Perceived Ease of Use variable will affect the Behavior Intention to Use variable.
6. H6: The Attitude to Use variable will impact the Behavior Intention to Use variable.

3.3 Participants

This study involved 47 participants who used the InaRisk BNPB platform with criteria over 18 years of age. Participants were selected randomly so that every resident who met the age criteria could be a participant. Initially, a survey was conducted involving 153 individuals to analyze the utilization of the InaRISK Platform. Based on the survey, out of the 153 respondents, 106 individuals had yet to be aware of or used the InaRISK platform. Meanwhile, the remaining 47 individuals were already familiar with and using the InaRISK platform and subsequently became participants in the study for the TAM analysis. Therefore, the researchers only included 47 respondents due to the limited number of individuals who were aware of and using the InaRISK platform. Participants will be analyzed based on age, location of residence, occupation, disaster experience, education level, gender, and membership status in disaster management organizations or communities.

3.4 Sources, techniques, and data collection tools

This study draws its data from both primary and secondary sources. Primary data pertains to information obtained directly from the field, specifically concerning the reception of the BNPB InaRISK platform within the community. Primary data collection was executed through a questionnaire approach, with the data collection instrument being the questionnaire itself. The questionnaire used for TAM analysis comprises a total of 25 items, distributed as follows: 8 items for the perceived usefulness variable, 5 items for the perceived ease of use variable, 6 items for the attitude toward use variable, and 6 items for the behavioral intention to use variable. The questionnaire was structured using a Likert Scale, utilizing a 5-point scoring scale that ranges from 1 to 5. A more positive response from the respondents corresponds to a higher score for each questionnaire item. Before implementation in the study, the questionnaire underwent a validity analysis, including Pearson's Product Moment Correlation analysis, to ensure its reliability and accuracy.

Secondary data is acquired through the retrieval of written documents, central and local government policies and regulations, as well as library resources from previous journal articles. Additionally, secondary data is collected through online sources, including the internet and other online platforms that offer data access and retrieval capabilities. The secondary data in this study is utilized to bolster the research foundation. Through secondary data, this research becomes more focused as it is designed to further develop previous studies. Additionally, secondary data is also used to elaborate on research outcomes, allowing for a more comprehensive synthesis to address the issues within the study.

3.5 Data analysis technique

The study employed various data analysis methods, comprising quantitative descriptive analysis techniques, simple linear regression analysis techniques, and multiple regression analysis techniques. Descriptive analysis was utilized to assess the respondent's profile and the frequency distribution of each research variable. With descriptive analysis, we can determine how respondents answered each variable, including the minimum and maximum values obtained by respondents, and the average responses of the respondents. The results of the descriptive analysis also show the categories or levels of acceptance that respondents provided for the InaRISK platform in general.

Linear regression was utilized to examine the influence of the determinant variable on the dependent variable within the TAM model. The linear regression analysis encompasses both simple and multiple regression analyses and the coefficients of Beta and determination. Simple regression analysis was applied to assess the impact of the perceived ease of use variable on the usefulness variable and to evaluate the influence of the attitude toward the use variable on the behavioral intention to use variable. In contrast, multiple regression analysis was employed to investigate the combined effects of perceived ease of use and perceived usefulness variables on the attitude toward the use variable and to analyze the concurrent impact of these two variables on the behavioral intention to use variable. Furthermore, the analysis encompasses a coefficient of determination assessment to gauge the strength of influence, as well as beta coefficient analysis to scrutinize the significant contribution of independent variables to each hypothesis's dependent variable. Additionally, the data analysis encompasses preliminary tests or classical assumption tests to determine the suitability of the data for regression analysis. The classical assumption tests conducted in this study encompass the normality test using the Kolmogorov-Smirnov technique, the multicollinearity test involving the examination of Tolerance and VIF values, and the heteroscedasticity test conducted using Spearman's Rho.

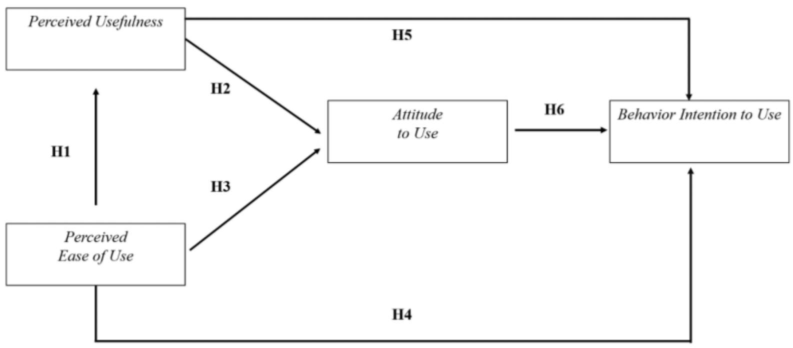


Figure 2. Design of the study

4. RESULT

4.1 Descriptive analysis

A set of questionnaires was distributed to 47 respondents who had experience using the BNPB InaRisk Platform. The gathered data was subsequently subjected to analysis using the SPSS program. The study examined four variables to validate the research hypotheses, which encompassed the following variables: X1 (Perceived Usefulness), X2 (Perceived Ease of Use), Y1 (Attitude to Use), and Y2 (Behavior Intention to Use). In summary, an overview of the research variables is presented in Table 1 below.

The results of the descriptive analysis show that the variable with the highest average is the perceived usefulness variable (X1), with a score of 83.72%. In the second place, there is the behavior intention to use variable (Y2), with a score of 81.50%. In third place is the attitude to use variable (Y1), with a score of 78.73%. On the other hand, the variable with the lowest mean value is perceived ease of use, which scored 75.16%. Moreover, the data analysis results indicate that all four variables have an average score falling within the high category.

4.2 Hypothesis 1: The effect of perceived ease of use on perceived usefulness

A straightforward analysis using linear regression was conducted to explore how the perceived ease of use variable affects the perceived usefulness variable. The findings of this analysis reveal that the perceived ease of use variable has a positive and statistically significant impact on the perceived usefulness variable (t=2.172, P<0.05). The perceived ease of use variable explains 9.5% (R Square) of the variation observed in the perceived usefulness variable. Although this contribution might appear relatively small, it emphasizes the significance of the perceived ease of use variable in influencing the perceived usefulness variable. Furthermore, the substantial enhancement of the perceived usefulness variable is reflected in the Beta coefficient associated with the perceived ease of use variable. Notably, a positive Beta coefficient indicates that a one-unit increase in the perceived ease of use variable results in a 36.7% increase in the value of the perceived usefulness variable. A detailed summary of the outcomes of the simple linear regression analysis concerning the impact of perceived ease of use on the perceived usefulness variable can be found in Table 2 below.

4.3 Hypothesis 2 and Hypothesis 3: The effect of perceived usefulness and perceived ease of use on attitude to use

The multiple linear regression analysis demonstrated that both the perceived usefulness variable and the perceived ease of use variable, when considered together, had a significant impact on the attitude to use variable (F=15.415, P<0.05). The combined influence of both the perceived usefulness variable and the perceived ease of use variable on the attitude to use variable accounts for 41.2%, while the remaining impact is attributed to other variables. You can access comprehensive results of the multiple regression analysis concerning the effects of the perceived usefulness and perceived ease of use variables on the attitude to use variable in Table 3 below.

The perceived usefulness variable significantly and positively impacts the attitude to use variable (t=4.163, P<0.05). The extent of the increase in the attitude to use variable can be gauged by the Beta coefficient associated with perceived usefulness. The analysis results indicate that the Beta coefficient for the perceived usefulness variable is 46.4%. Given the positive Beta coefficient results for the perceived usefulness variable, it's important to note that a one-unit increase in the perceived usefulness variable will result in a 46.4% increase in the value of the attitude to use variable.

Furthermore, the perceived ease of use variable also exerts a significant influence on the attitude to use variable, as evident from the values t=2.212 and P<0.05 (0.032). The perceived ease of use variable demonstrates a positive and statistically significant effect on the attitude to use variable, characterized by a Beta coefficient of 29.4%. The Beta coefficient associated with perceived ease of use signifies the extent of the increase in the attitude to use variable. According to the analysis results, a one-unit increase in the perceived ease of use variable will result in a 29.4% increase in the value of the attitude to use variable.

Table 1. The result of descriptive analysis of variables

Variable	N	Minimum	Maximum	Mean	Std. Deviation	Category
X1	47	62.5%	97.5%	83.72%	3.20	High
X2	47	52%	100%	75.16%	2.69	High
Y1	47	60%	100%	78.73%	2.94	High
Y2	47	63.3%	100%	81.50%	3.27	High
Valid N (listwise)	47					

Source: Data analysis result (2022)

Table 2. The effect of perceived ease of use on the perceived usefulness variable

Hypothesis	Coefficients	t Statistics	P-value	Result	R Square
Perceived Ease of Use → Perceived Usefulness	36.7%	2.172	0.035	Significant	9.5%

Source: Data analysis result (2022)

Table 3. The effect of perceived usefulness and perceived ease of use on attitude to use variable

Hypothesis	Coefficients	Standard Error	t Statistics	P-Value	R Square
Perceived Usefulness → Attitude to Use	46.4%	0.111	4.163	0.000	0.412
Perceived Ease of Use → Attitude to Use	29.4%	0.133	2.212	0.032	0.412

Source: Data analysis result (2022)

4.4 Hypothesis 4 and 5: The effect of perceived usefulness and perceived ease of use on behavior intention to use

A multiple linear regression analysis was employed to assess both the collective and individual impacts of the perceived usefulness and perceived ease of use variables on the behavior intention to use variable. The results of this multiple linear regression analysis revealed that both the perceived usefulness variable and the perceived ease of use variable had a simultaneous effect on the behavioral intention to use variable (F=43.676, P<0.05). Collectively, the perceived usefulness variable and the perceived ease of use variable accounted for 66.5% of the variance in the behavior intention to use variable, while the remaining 33.5% was attributed to other factors. Further details regarding the outcomes of the multiple regression analysis on the effects of the perceived usefulness and perceived ease of use variables on the behavior intention to use variables can be found in Table 4 below.

The analysis of the perceived usefulness variable's impact on the behavioral intention to use variable yielded a t-value of 4.014 and a P-value of 0.000 (<0.05). These findings strongly suggest that the perceived usefulness variable significantly influences the behavioral intention to use variable. Furthermore, the Beta coefficient associated with the perceived usefulness variable stands at 37.6%. In practical terms, if the perceived usefulness variable increases by one unit, the behavioral intention to use variable will experience a 37.6% increase.

Additionally, the results of the multiple linear regression analysis demonstrate that the perceived ease of use variable also significantly affects the behavioral intention to use variable. This is evident through the t-value of 6.793 and a P-value of 0.000 (<0.05). The Beta coefficient associated with the perceived ease of use variable is positive, measuring at 75.8%. In practical terms, a one-unit increase in the perceived ease of use variable will lead to a substantial 75.8% increase in the behavioral intention to use variable.

4.5 Hypothesis 6: The influence of attitude to use on behavior intention to use

The results of the simple linear regression analysis clearly demonstrate the profound and statistically significant impact of the attitude to use variable on the behavioral intention to use variable. The analysis revealed a t-value of 7.189 and a P-value of 0.000 (<0.05), indicating a robust and statistically significant influence of the attitude to use variable on the behavioral intention to use variable. In fact, the attitude to use variable explains 53.5% of the variance in the behavioral intention to use variable, with the remaining 46.5% attributed to other factors. Furthermore, the Beta coefficient associated with the attitude to use variable is notably high, measuring at 81.3%. In practical terms, this means that a one-unit increase in the attitude to use variable leads to an impressive 81.3% increase in the behavioral intention to use variable. Detailed findings regarding the impact of the attitude to use variable on the behavioral intention to use variable can be found in Table 5 below.

The findings of this study reveal that all independent variables exert a positive and substantial influence on the dependent variable. Out of the six hypotheses put forth, each one has been corroborated by the analysis. A comprehensive overview of the outcomes for all six hypotheses within the TAM model employed in this research is depicted in Figure 3.

Table 4. The effect of perceived usefulness and perceived ease of use on behavior intention to use variable

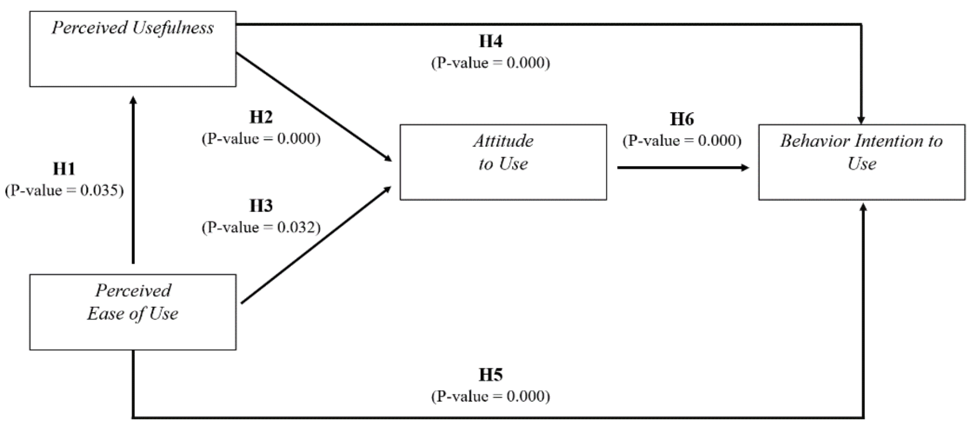
Hypothesis	Coefficients	Standard Error	t Statistics	P-Value	R Square
Perceived Usefulness → Behavior Intention to Use	37.6%	0.094	4.014	0.000	0.665
Perceived Ease of Use → Behavior Intention to Use	75.8%	0.112	6.793	0.000	0.665

Source: Data analysis result (2022)

Table 5. The influence of attitude to use on behavior intention to use variable

Variable	Coefficients	t Statistics	P-Value	Result	R Square
Attitude to Use → Behavior Intention to Use	81.3%	7.189	0.000	Significant	53.5%

Source: Data analysis result (2022)



Source: Data analysis result (2022)

Figure 3. Results of hypotheses analysis in the TAM model

5. DISCUSSION AND CONCLUSION

The outcomes of this investigation highlight several significant relationships within the TAM model. Firstly, it has been established that perceived ease of use indeed affects perceived usefulness. Furthermore, both perceived ease of use and perceived usefulness were observed to exert a substantial influence on the attitude toward use and the behavioral intention to use. Moreover, it was evident that the attitude toward use had a substantial impact on the behavioral intention to use. These findings underscore the importance of enhancing the quality of the InaRisk platform to improve its usability, effectiveness, and user-friendliness, ultimately leading to increased acceptance and intention to use among its users.

These findings align with research conducted by Brar et al. [56], who investigated the usage of an IoT-Based Indoor Disaster Management Software Tool among disaster rescue workers. Brar et al. [56] similarly found that perceived ease of use influenced perceived usefulness, which, in turn, affected the attitude toward use. The attitude toward use was identified as a significant factor influencing the intention to use the system. Additionally, perceived ease of use was found to have a direct impact on the intention to use. Another study by Aloudat et al. [57] also produced relevant findings, indicating that both perceived ease of use and perceived usefulness played roles in shaping the attitude toward use, and this attitude had an impact on the intention to use the system.

The results of other studies that produced similar findings include a study from Mailizar et al. [58] regarding the E-Learning platform. Then, the study of An et al. [59] regarding the use of Telehealth innovations during the COVID-19 Pandemic. Another study by Andy et al. [60] researched TAM on the Digital Village application. Furthermore, there is also a study from Alifiardi [61] which examines the GoJek platform or startup. From this study, it can be generalized that the complete and useful features of the application and its ease of use affect the use of the application in the broader community.

The results of the study by Sari and Kenegae [62] also state that perceived usefulness has a substantial and significant effect on behavior intention to use for users of the Magelang District Disaster Information System (SIKK Magelang). These results strengthen that the primary determinant that affects technology adoption in a person is the aspect of usefulness. When technology is able to facilitate and benefit a person, then dependence on technology will increase, and increase the possibility of long-term use of the technology. The important aspect of perceived usefulness requires stakeholders to emphasize the importance of the usefulness aspect in disaster applications.

The addition of features on the InaRisk platform needs to be done to increase the completeness of the information users can access and learn. Achieving this objective can be facilitated by creating avenues for community engagement, particularly for individuals residing in high-risk regions, enabling them to contribute to application development and offer insights into the essential information to be incorporated into the application [62]. Bjerge et al. [63] also stated that adding features to the disaster information system will increase the use of the information platform. Modifications to the technical architecture, functionalities, and graphical user interface enhancements contribute to refining user engagement and optimizing system performance.

The improvement of quality, features, and utility of the disaster information platform becomes highly important because in the entire disaster management process from start to finish, information technology plays a major role in achieving successful disaster risk reduction whenever a disaster occurs. The use of digital information technology is effective in the preparedness, response, recovery, and mitigation phases [29]. Hence, it would be more advantageous if the disaster information platform were designed to facilitate comprehensive disaster management, encompassing mitigation, preparedness, response, and recovery stages. However, what has happened so far is that often the development of disaster information platforms is separate and independent at each stage of disaster management. This condition causes disaster information to become less integrated and less effective. It is necessary to better integrate information system so that it will be more effective. The combination and integration of various systems will effectively present disaster issues in the field. As an illustration, data regarding disaster risk preparedness can be seamlessly integrated with real-time information gathered during the response phase. This integration not only enhances resilience but also elevates public awareness. By amalgamating disaster risk information with real-time data during the response phase, local governments can issue timely, specific warnings that prove invaluable to residents residing in high-risk regions [64].

In addition, in order to be useful in disasters, disaster information technology must be used routinely and can be compatible with other systems. If the system cannot be compatible with the other stakeholder terms, it will not be used by stakeholders in a disaster [63]. Therefore, the information system must also be designed to enable the sharing of information among different stakeholders to improve the quality of coordination and collaboration. It is also necessary to standardize the data shared in the system by each stakeholder so that information sharing can run well and effectively [64].

Sharing information between various stakeholders will be so effective because it will enable forming an integrated disaster management information system expected to coordinate various government agencies from every level and field. This is important because disaster management is an interdisciplinary and interagency task and responsibility involving many government agencies. However, even though each department or agency has a complete database, the data usually has incompatible units, formats, precision, and accuracy, making integrating data into disaster management information systems challenging. Therefore, there is a need for standardization of data among government agencies responsible for disaster management.

Disaster is also a spatial phenomenon. Thus, it has become necessary for disaster management and disaster information systems to integrate geospatial technology or technology based on Geographic Information Systems (GIS). GIS provides a spatial database that is very useful in disaster management. Leveraging GIS enables the identification and mitigation of disaster risks, more effective disaster planning and preparation, improved disaster response capabilities, and faster disaster recovery processes. With GIS, it will be easy to make decisions in disaster management [65, 66]. Based on that potential, GIS must be the starting point of the disaster information system that is created, or in the sense that every disaster information system must include GIS and become the system's core.

Therefore, as the InaRisk platform discussed in this study is a GIS-based disaster information platform, InaRisk has the potential to be a starting point for developing an integrated disaster information system. Many research results suggest the role and potential of GIS in disaster risk reduction efforts [17] [67-72]. As a GIS-based disaster information system, InaRisk must continuously improve its quality and features. InaRISk should be more useful, and more people use it. InaRisk is expected to be able to collaborate with data from other departments responsible for disaster management so that the information displayed is more detailed and in real-time. With a database integrated with other institutions, InaRisk can assist in the decision-making process in the disaster management process at every stage, from mitigation, preparedness, and response, to recovery.

6. IMPLICATIONS

6.1 Theoretical implications

The theoretical implication of this research is that further research can be directed at developing and innovating an integrated disaster information platform that can facilitate disaster management spanning from the pre-disaster phase, through the duration of the disaster, and into the post-disaster period, GIS plays a pivotal role in disaster management. For example, integrating information about disaster risks with evacuation routes, evacuation points, nearest rescue facilities, disaster-affected areas, number of disaster victims, distribution of shelter locations, and so on. Indeed, in Indonesia, several disaster information platforms are used at the national and local levels. Further research can further analyze the existing platforms to get a more detailed picture and develop better platform innovations that various disaster management actors can use. Further research can also develop a more integrated disaster information platform at the local level, as platform development at the local level often accommodates the need for more detailed, comprehensive, and up-to-date databases.

Future research endeavors should encompass a wider spectrum of participants, extending beyond the general public to encompass various stakeholders engaged in disaster management. This includes members of disaster preparedness groups, Regional Disaster Management Agency (BPBD) personnel, and the Indonesian Red Cross (PMI), the Police and the Military, as well as other security agencies, Search and Rescue teams, humanitarian agencies and NGOs working in disasters, nurses and doctors, and all government agencies responsible for disaster issues. All stakeholders responsible for disaster problems must understand and use technology. Then, the technology needed and used by each actor involved is usually also different. This study also only uses a quantitative approach. Future research is expected to combine quantitative and qualitative methods to obtain more detailed data.

6.2 Practical implications

The feature development in InaRisk is critical to do by the National Disaster Management Agency (BNPB). More complete features will assist users in accessing more detailed and useful disaster information. The resolution of the displayed image data must also be increased with the aim of simplifying the process for users to analyze and comprehend. Moreover, the level of detail of the information displayed by InaRisk must be increased to have a more tangible impact on the community with a smaller scope than the district/city scale.

To acquire more comprehensive insights, fostering openness and facilitating information sharing among sectors and stakeholders is of paramount importance, for example, between the Meteorology, Climatology, and Geophysics Agency (BMKG), relevant Ministries, Indonesian Red Cross (PMI), Indonesian Geological Agency, and others, so it will improve the quality and detail of the information presented on the InaRisk platform. Coordination and cooperation with various institutions and related stakeholders are also crucial to increase the usefulness and detail of InaRisk's information and services or features. Collaborating with experts and practitioners in the information and communication technology field must also be carried out so that the development of InaRisk can be directed to be better and more useful and help the community.

It is imperative to formulate a comprehensive IT strategy that encompasses the management of IT resources. Government policies are needed to strengthen the realization of IT-based disaster management both at the government level and at the general public. Various staff of institutions and actors, as well as the community who are responsible and play a role in disaster management, also need to receive education and training in the use of information and communication technology in disaster management. To realize this, access to technology and information for the public must also continue improving.

Advocating for the increased use of information and communication technology in disaster management within the community is crucial. It is essential to elevate the adoption of information and communication technology in disaster management to bolster community preparedness. The primary target for advancing information and communication technology is the community; thus, individuals should be adequately informed and educated about the capabilities, attributes, and applications of InaRisk technology. Vulnerable communities should also be prioritized to obtain clear and detailed information about disasters to improve their preparedness.

Using the InaRISK platform can be promoted through educational institutions in schools to ensure that the public becomes familiar with it from an early age. Mass promotion can also be conducted within community-based disaster management organizations in each region, such as Disaster Preparedness Groups (KSB) and Disaster-Resilient Villages (KATANA), as well as other community organizations at the local level. Furthermore, promoting the use of the InaRISK platform can also be done through village and sub-district governments, thus reaching the smallest community levels.

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