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Research article

The Impact of Personal, Environmental, and Information Platform Factors on Disaster Information Sharing on Twitter

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ABSTRACT

Twitter has become a major platform for disseminating disaster news, providing people with disaster information quickly and precisely. A lot of essential and valuable information can be obtained from this online platform. Twitter users might be able to help with warnings and submit specific and accurate information in a disaster situation. This research attempts to examine factors that affect disaster information-sharing behavior. Furthermore, this study aims to integrate personal, environmental, and information platform factors to gain more insight into the factors influencing Twitter users' willingness to share disaster information. The hypotheses were tested using Partial Least Squares Structural Equation Modeling (PLS-SEM). The result showed that Altruism, Self-efficacy, Community Identity, and Information Platforms significantly influence people's decisions to share disaster information on Twitter.

1. Introduction

Natural disasters occur worldwide, and they happen very often [1]. The world risk report reveals that of 171 countries, developing countries have a higher risk of the occurrence of a natural disaster [2]. Indonesia is located geographically in the pacific ring of fire, in the two-lane mountain ranges where natural disasters frequently occur. This geographical location has several implications, including earthquakes, volcanic activities, and eruptions in various Indonesian islands. In addition, Indonesia is located in the convergence boundaries between three tectonic plates, the Eurasian Plate, the Pacific Plate, and the Indo-Australian Plate, which move rapidly, causing Indonesia to experience multiple earthquakes and tsunamis. Meanwhile, as an archipelagic country located on the equator, Indonesia has two seasons, namely, the rainy and dry seasons. This condition makes Indonesia prone to potential hydro-meteorological disasters and heavy rains that can cause floods, landslides, and prolonged droughts.

In the first three weeks of 2021, 185 disasters happened in Indonesia. Most of them were floods, earthquakes, and landslides. Indonesia recorded at least 297 disasters in January last year, including floods in Jakarta. However, this year's disasters are more destructive than the previous one, in which 166 people lost their lives in January 2021, significantly higher if compared to 91 deaths due to natural disasters in January 2020. Natural disasters are common in Indonesia as the archipelago sits on the

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Pacific Ring of Fire. In addition, the severity of the disasters is also affected by forest destruction and climate change [3].

Social Media have an essential role in information management in this twenty-first century. They have a vital role in all stages when natural disasters occur, through which many people actively send and receive information [4]. People use social media innovatively during disasters for specific purposes. When a disaster occurs or after the disaster ends, people use social media to collect, share and disseminate information [5]. Twitter is one of the social media platforms for sharing information, especially for disasters [6, 7]. Twitter has become a more prominent interest for government authorities and first responders in Indonesia as a communication platform for disaster management. For example, BNPB, as an emergency agency, frequently informs the public about post-natural disaster management, then provides information about the impacts that may emerge as an outcome of the disaster. For example, it broadcasts whether there were casualties, the number of victims, as well as the levels of damage caused to housing, residential areas, public facilities, and infrastructures [7]. Twitter produces timely information when a disaster occurs from Twitter users at the disaster site who know the crucial situation. Twitter users might potentially monitor warnings and submit more specific or accurate information by sharing the disaster information on the platform, further supporting authorized organizations during a disaster. By obtaining recent information, relevant government organizations can provide timely support to residents. Furthermore, information shared on Twitter has a significant impact on disaster management.

According to social cognitive theory, learning occurs in a social situation with a dynamic and bidirectional interaction between the individual, environment, and behavior [8]. Personal factors can influence an individual's assessment of the external environment and the choice to act in any behavior. Meanwhile, altruism is also considered the primary factor that shapes the users' behavior. Furthermore, the environmental factor is among the various factors influencing a person's behavior [14]. In addition, social interaction ties and community identifications are parts of environmental factors that influence personal factors and behaviors.

Previous studies primarily focused on individual and environmental factors in sharing information [9,10,11], but disaster information sharing on social media was rarely discussed. Furthermore, humanitarian information management is crucial in information-sharing behavior because it is essential for coordinating the humanitarian response [15]. The quicker a humanitarian can gather, analyze, and spread critical information, the more effective the response will be, and more lives can possibly be saved. Moreover, as an information platform, Twitter also significantly impacts information sharing. Twitter provides timely, reliable, and accurate information during a crisis. As a real-time platform, Twitter enables traditional journalists and "citizen journalists" to deliver quick situation reports [6]. Therefore, this research examines the characteristics of an information platform that serves as a part of humanitarian information management, and this focus makes this research different from other previous studies.

This research utilizes the social cognitive theory and information platform characteristics in disaster information sharing. This research aims to combine personal, environmental, and characteristics of information platform factors to better understand which factors affect Twitter users to share disaster information the most. By understanding the factors that impact the dissemination of disaster information, stakeholders or governments can influence communities to assist in disaster information sharing, so that disaster management can be carried out quickly and precisely.

2. Theoretical Background and Research

2.1. Theoretical Background

Social Cognitive Theory

The social cognitive theory discusses the relationship between personal and environmental factors and individual behavior [8]. It offers a critical viewpoint for examining why people embrace certain attitudes [9]. For example, Oh and Syn [10] apply the theory to investigate the influential factors that motivate

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dynamic and enthusiastic involvement in sharing information. Their research looks at what drives users to share their personal experiences, information, and social support with others on social media.

Kim, Lee, and Elias [11] analyze the interaction effects of personal and environmental factors on information sharing on social media. Further, Chiu, Hsu, and Wang [12] identify the reasons underlying the information-sharing behavior in virtual networks. Moreover, Hsu and Lin [16] use the social cognitive theory to analyze why blog users (bloggers and readers) are involved in blog activities. Personal factors in the social cognitive theory can be associated with cognitive, emotional, or biological traits that influence an individual's perceptions and behaviors [14]. According to Oh and Syn [10], altruism is the most influential motive for which individuals actively seek and share information with others to answer questions. Altruism is defined as a person's willingness to improve the welfare of others without expecting any reward [10, 13]. As a predictor of Information-sharing intention, altruism is regarded as one of the essential factors influencing user behavior. Meanwhile, community identification and Social Interaction Ties are the environmental factors influencing personal factors and behavior.

The environmental factor refers to the conditions that might influence a person's behavior. Community identification emphasizes the impression of belonging to a specific community [10, 13]. Social media users may develop attachments to specific forms of social media they regularly use [13, 17]. Social Interaction Ties describe the strength of connections, the amount of time used, and the frequent communication between members of online communities [12].

Twitter as an Information Platform to Share Humanitarian Information

Humanitarian information is essential in creating practical humanitarian assistance, coordination, and decision-making during a disaster [18]. Disaster information is sometimes difficult to obtain because of the lack of accessibility of the impacted region, the loss of communication infrastructure, and the remoteness of the impacted area [19]. In the absence of information, humanitarian organizations typically rely on standard emergency supplies such as equipment for communications, shelter, residential, storage, kitchen equipment, water logistics, food, cleaning and sanitation items and devices, material handling equipment, and electrical power supply equipment [20].

Humanitarian information is typically not given by the affected community but comes from various sources, including social media, media exposure, and other responder groups already on site. Social media, particularly Twitter, a massively popular media platform used during disasters [21, 22, 23, 24], attracts attention for sharing information. Therefore, Twitter has a big role in sharing disaster information.

Over the last ten years, humanitarian information principles have been created to guide the processes of gathering, verifying, sharing, and utilizing information [15]. There are 14 principles in humanitarian information management; they are accessibility, inclusiveness, interoperability, accountability, verifiability, relevance, objectivity, humanity, timeliness, sustainability, confidentiality, reciprocity, reliability, and impartiality.

2.2. Research Framework and Hypotheses

This research was carried out to investigate the behavior of Twitter users when sharing disaster information. In this research, the hypotheses are evaluated using PLS-SEM. Figure 1 shows the applied model in this research.

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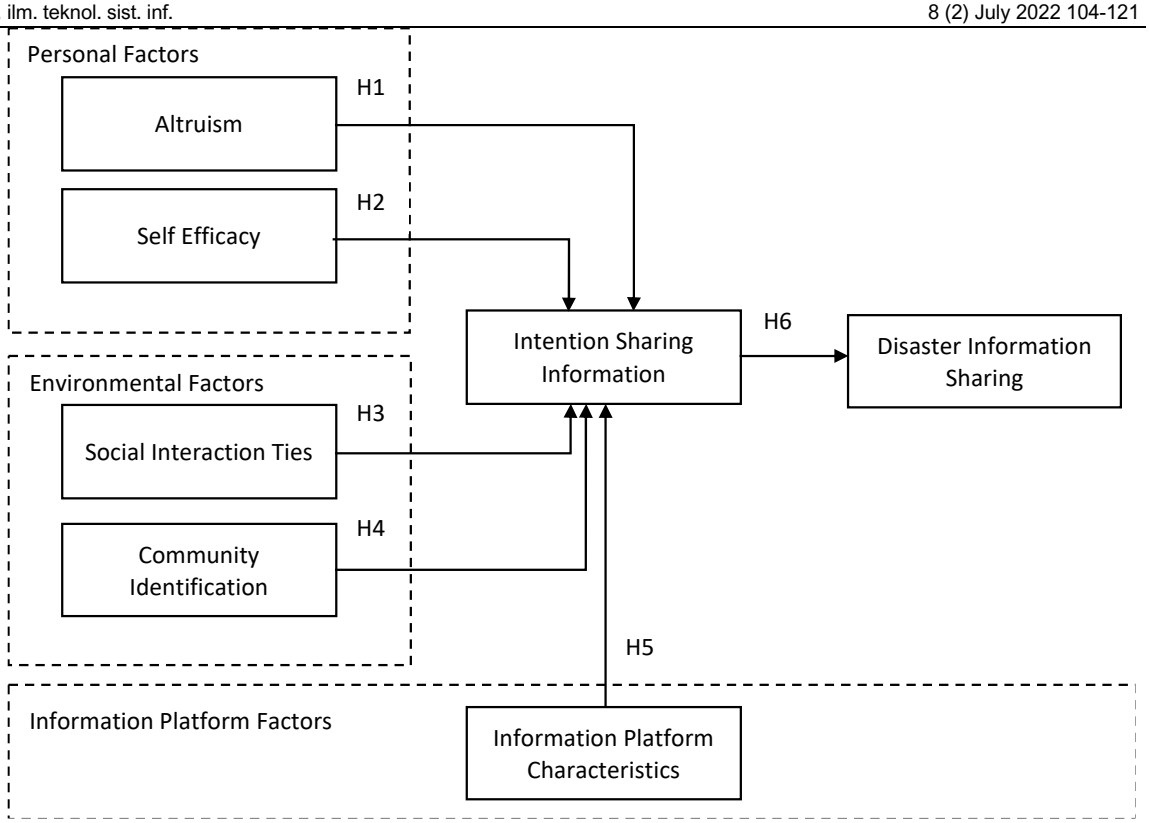

Figure 1. Research framework

Altruism refers to providing something to someone without expecting anything in return [10]. Through motivation studies involving information sharing on social media, altruism is one of the most widely studied components [13, 25, 26]. Altruism has a direct and significant impact on information sharing on the internet [27]. Moreover, altruism is one component that has a significant influence compared to other intrinsic components in tacit knowledge sharing [28]. Furthermore, altruism greatly impacts brand groups on online social networking sites [29].

Moreover, Oh [30] found that altruism is the most significant motivation in which individuals actively seek information and share it with others to answer questions. Furthermore, altruism is likely to be associated with the intention of sharing disaster information on Twitter because Twitter users are more likely to help others without expecting a reward or return. As a result, the following hypotheses are developed:

H1: Altruism affects the intention of sharing information

Self-Efficacy is the ability to perform and complete tasks [31] and is commonly used to understand knowledge-sharing behavior [32]. [11] state that the ability to share information with others is necessary for sharing information on social networking sites; individual efforts to conduct the activity are higher and more persistent as perceived self-efficacy increases. A person's ability to do a task is needed in sharing information, so self-efficacy is also needed [9]. Furthermore, victims with greater self-efficiency frequently show more positive behavior during a disaster, particularly concerning helping others [33, 34], so people with a strong sense of self-efficacy are more willing to share disaster information with others. As a result, the following hypothesis emerges:

H2: Self Efficacy affects the intention of sharing information.

Previous researchers [12, 35, 36] mention Social Interaction Ties in their respective research. Social Interaction Ties refer to the impersonal arrangement of relationships between members of a social

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network and the degree to which they are linked to one another [12]. Tsai and Ghoshal [37] view Social Interaction Ties as information and resource flow routes. The Social Interaction Ties among Twitter users, in this case, individuals who share the information with their followers, may allow cost-effective access to a broader range of information resources. Therefore, the hypothesis is presented as follows:

H3: Social Interaction Ties affect the intention of sharing information.

Prior studies find that social media users consider identifying communities when sharing information. The essence of social media being a place where people gather together, communicate with each other, and establish communities is represented by community identification [10]. Ridho [38] found that community participation positively impacts tourism sustainability and satisfaction. Furthermore, Hsu and Lin [13] found that their community identification highly impacted a blog participant's desire to continue using blogs; users were eager to write because of their community identification. Moreover, people in one community on Twitter have particular common interests and share their personal feelings and daily experience [39]. Hence, Twitter users with the same interest in disaster events will intend to share the disaster information with others on social media. Furthermore, the following hypothesis is proposed:

H4: Community identification affects the intention of sharing information

Information management is essential during a crisis or disaster because it is essential for international humanitarian response coordination [15]. During a crisis, gathering and disseminating fast, trustworthy, and accurate information is crucial for enhancing humanitarian response, optimizing resources, and reducing human suffering. The faster a humanitarian can gather, evaluate, and distribute critical information, the more successful the response will be, and the more lives will be saved. According to Kongthon et al. [6], the information generated when flooding occurred was particularly timely because these Twitter users were present in the region and understood what had been happening during crucial conditions. Citizens might potentially monitor warnings and submit more specific or accurate information to support authorized organizations during a disaster. By accessing recent information, associated government organizations might utilize it with requests for assistance to provide timely support to the impacted residents. As a real-time platform, Twitter enables traditional journalists and "citizen journalists" to update situations quickly. Therefore, as an information platform that can provide timely, reliable, and accurate information, Twitter is expected to make its users have the intention to share disaster information. Thus, the following hypothesis is proposed:

H5: Information platform characteristics affects the intention of sharing information.

Behavioral intention has previously been demonstrated to be significantly related to actual behavior [40]. Behavioral intentions are a source of motivation that evaluates how hard people are willing to strive to accomplish a behavior. It is based on the TPB (theory of planned behavior), which assumes that distinct voluntary behavior is a person's desire to act in a certain way [41]. The TPB's core principle is that a person's desire to behave directly predicts their intended behavior. The intention is predicted by three constructs: attitude, subjective norm, and perceived behavioral control [42]. Java et al. [39] found that one of the main user intentions in Twitter posts is to share information, and about 13% of all the posts from Twitter users are for information sharing. Therefore, Twitter users will share disaster information with others because they intend to share it. Hence, the following hypothesis is suggested:

H6: The intention of sharing information affects sharing information behavior.

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2.3. Research Method

The research framework was developed from a literature review of a previous study. Personal and environmental factors are widely used by researchers in studies related to knowledge or information sharing [9, 11, 43]. Personal and environmental factors are directly related to individuals in disseminating information. Furthermore, Twitter as a platform also has an influential role in information sharing; Twitter provides timely, reliable, and accurate information during the crisis. Moreover, there have been no comprehensive studies examining information platforms in disaster information sharing. Therefore, this research develops the previous studies, which were primarily focused on spersonal and environmental factors, by adding one more factor: the information platform.

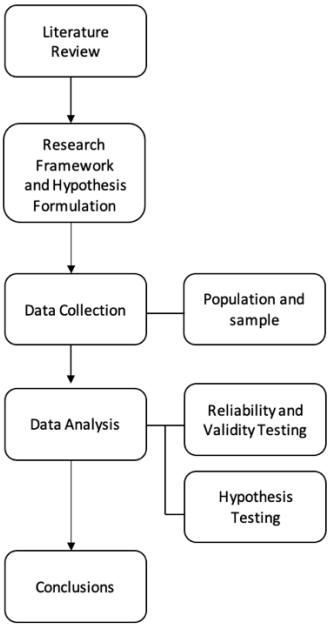

Figure 2. Research stages

The research stages are shown in Figure 2. This research is divided into five stages; literature review, research framework and hypothesis formulation, data collection, data analysis, and conclusion.

2.4. Research Instrument

2.4.1. Literature Review

This research was initiated with a literature study; in this stage, the researchers reviewed the literature on previous research related to disaster information sharing on social media. The social cognitive theory and humanitarian information management theory were the main two theories in this research; that is, personal and environmental factors and information platform characteristics from humanitarian information management can influence disaster information sharing on social media.

2.4.2. Research Framework

After analyzing the theory about disaster information sharing on social media, the next step is developing a research framework and formulating hypotheses. The research framework builds on the theory studied in the literature review. The research instrument was designed based on the theoretical framework. Furthermore, the research instrument was utilized to formulate hypotheses.

2.4.3. Instrument

This research investigates the factors that influence disaster information sharing. The research instrument was developed based on related previous studies. The dependent variables in this study are altruism and self-efficacy from personal factors, Social Interaction Ties, community identification from environmental factors, and information platform characteristics factors. Altruism is devotion to the welfare of others, so it is relevant to this study because Twitter users would like to help others without expecting anything in return. [10]. Some may believe that people should help each other.

Some studies state that self-efficacy is important in information sharing [32, 44, 45]. This factor is needed in this research because the ability of individuals to perform tasks is essential. The context of this research is the ability to share disaster information.

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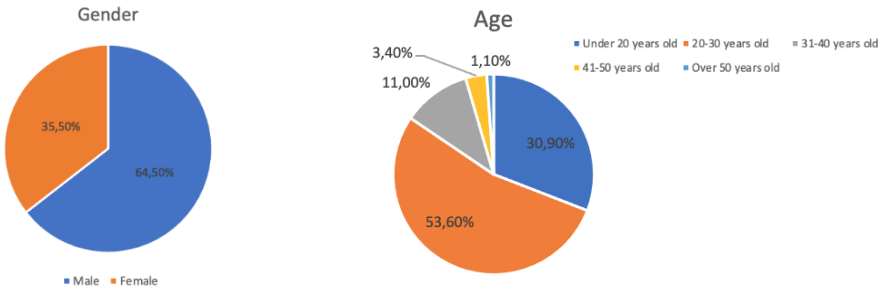
Information-sharing activities may bring together a group of people interested in a particular issue, help build a community, foster community identity, and stimulate a range of activities within the community. People may have the same interest in disaster events and share the information with those with the same interest.

Social Interaction Ties are relationships between members in virtual communities in terms of time spent and communication frequency [12]. These constructs were adopted because social interaction ties among Twitter users may enable more cost-effective access to a larger number of information sources. Regarding Twitter as an information platform, the investigation of accessibility, timeliness, sustainability, interoperability, and relevance should be done. The possible explanation is the characteristic of Twitter itself; it provides timely, reliable, and accurate information, and as a platform, it supports the disaster information-sharing process.

2.4.4. Data Collection and Participants

The questionnaire was administered online through Twitter, Facebook, Instagram, and online chatting groups, such as Line and WhatsApp. The participants who filled in the questionnaire were Twitter users in Indonesia. The data was collected on May 19th, 2021. There were 30 initial sample data used for validity and reliability testing. After it was ensured that the data was valid and reliable, the questionnaire was administered on a larger scale until May 25th, 2021.

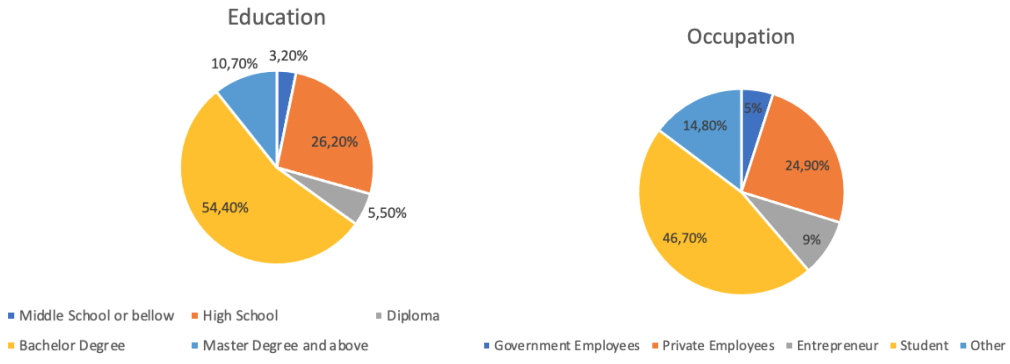
There were 366 responses collected, but only 286 responses were eligible to be analyzed. Figure 3 below shows the participants' characteristics according to their demographics.



(a) (b)

Figure 3. (a) Participants' gender; (b) Participants' ages

Figure 3 presents the participants' ages, mainly ranging from 21 to 30 years old, and the majority were female. The participants' educational levels ranged from SMP (Middle School Students) or lower to master's degree or higher, and they came from different occupations (Figure 4). According to the graph above, the participants consist of diverse groups of individuals, and the information acquired from the participants might be a valuable addition to the community. As shown in the graph, age is not a barrier for people to share disaster information; it shows that the participants are diverse in terms of their ages, ranging from below 20 to over 50 years old.



(a) (b)

Figure 4. (a) Participants' education; (b) Participants' occupations

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2.4.5. Measures

The measurement items mainly were adapted from previous related studies in the virtual community and were modified to fit the disaster information sharing on Twitter. Altruism was measured using three items, which were adapted from Hsu and Lin [13]. Self-efficacy was measured with eight items from Compeau and Higgins [45]. Lu and Yang proposed two Items for measuring Social Interaction Ties. Furthermore, community identification was measured using four items adapted from Hsu and Lin [13]. Information platform characteristics are grounded on accessibility, inclusiveness, interoperability, verifiability, relevance, timeliness, and sustainability [29]. The Information platform characteristics were measured with nine items, three from Van de Walle and Comes [15], and the other six were adapted from Wixom and Todd [47]. The information-sharing intention was measured using four items from Ahmad, Zani, and Hashim [9] as well as Chen and Chen [54]. Disaster information sharing was measured using three items adapted from Chen and Chen [54]. All the items were measured using a 6-point Likert scale: 1 - Strongly disagree, 2 – Disagree, 3 - Somewhat disagree, 4 - Somewhat agree, 5 – Agree, 6 -Strongly agree. Details of items and their sources are given in the Appendix.

2.4.6. Data Analysis

The initial stage of the data analysis process is validity and reliability testing. Cronbach's alpha and composite reliability were used in the data reliability test. Cronbach's alpha measures internal consistency and how closely related item sets are as a group. Meanwhile, composite reliability measures consistency in scale items [48]. The validity testing of this research uses Average Variance Extracted (AVE) to evaluate convergent validity.

This research is based on a cross-section survey; therefore, testing for the quality of formative constructs is needed; it assesses collinearity diagnosis and the significance of formative items. Variance inflation factors not greater than 3.3. for each variable shows that there is no problem with common method variance [47].

The last part of this data analysis is hypothesis testing; Hypothesis testing was carried out using Partial Least Squares Structural Equation Modeling (PLS-SEM). The hypotheses were tested by observing the results of significant values based on the path coefficient values and t-statistics. This study uses a significant level of 0.05 and a critical value of 1.96 [48].

3. Results and Discussion

3.1. Results

3.1.1. Measurement Model

The initial step of this research was testing the reliability and validity of the data. For measuring internal consistency, Cronbach's alpha was used for reliability testing. It observes the close relationship between items as a group. Hair et al. [48] state that the absolute value of 0.7 to 0.9 is commonly used as acceptance criteria. All of the constructs have a value of more than 0.7. The other method to test reliability is composite reliability (CR). Composite reliability measures all latent variables exceeding the recommendation threshold of 0.7, with the lowest value being 0.85 from altruism, as shown in Table 1.

The data validation is calculated using convergent validity; if the items are loaded at a level larger than 0.6, it points out that the error variance has less shared variability than construct and measure [49]. To evaluate the convergent validity, we used the Average Variance Extracted (AVE), where a loading value of more than 0.50 is recommended to justify the use of the construct [48].

Table 1. Reliability and validity of the convergent result

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Construct	Cronbach's alpha	CR	AVE	Item	Outer Loading	Mean	SD
Altruism	0.75	0.85	0.66	AL1	0.82	5.08	0.92
				AL2	0.79	4.87	1.11
				AL3	0.83	5.16	0.91
Community Identification	0.85	0.90	0.70	IK2	0.82	4.37	1.26
				IK2	0.85	4.61	1.16
				IK3	0.85	4.41	1.30
				IK4	0.81	4.64	1.23
Social Interaction Ties	0.88	0.96	0.92	HI2	0.96	3.80	1.41
				HI3	0.96	3.57	1.45
Information Platform Characteristics	0.92	0.93	0.56	IP1	0.76	5.34	0.91
				IP2	0.81	5.39	0.86
				IP3	0.83	5.42	0.83
				IP4	0.82	5.05	1.01
				IP5	0.78	4.46	1.21
				IP6	0.77	4.95	1.03
				IP7	0.68	4.28	1.20
				IP8	0.68	4.72	1.09
				IP9	0.77	4.90	1.05
Self-efficacy	0.907	0.92	0.60	SE1	0.78	4.30	1.31
				SE2	0.62	4.44	1.30
				SE3	0.76	4.39	1.34
				SE4	0.83	4.19	1.35
				SE5	0.85	3.91	1.48
				SE6	0.74	4.49	1.23
				SE7	0.79	3.80	1.46
				SE8	0.80	4.03	1.47
The Intention of Sharing Information	0.94	0.96	0.86	NS1	0.88	4.72	1.20
				NS2	0.93	4.54	1.23
				NS3	0.94	4.72	1.14
				NS4	0.94	4.66	1.17
Disaster Information Sharing	0.88	0.92	0.81	BI1	0.90	3.85	1.39
				BI2	0.92	3.89	1.39
				BI3	0.87	4.22	1.37

Discriminant validity is determined by the square root of each construct's average variance (AVE); and inter-construct correlation. The results, as presented in Table 2, satisfy the discriminant validity because each construct exceeds all respective inter-construct correlations. The second method is analyzing cross-loading items [50]; the loading of the items of each construct was higher than their loadings in other constructs stated in Table 3. The outcome indicates that the items for each construct did not correlate with another construct.

Table 2. Discriminant validity

	AL	BI	SE	HI	IK	NS	IP
AL	**0.81**						
BI	0.46	**0.90**					
SE	0.39	0.49	**0.77**				
HI	0.36	0.46	0.34	**0.96**			
IK	0.54	0.60	0.46	0.56	**0.83**		
NS	0.56	0.67	0.67	0.42	0.55	**0.92**	
IP	0.53	0.48	0.48	0.46	0.63	0.50	**0.75**

Table 3. Loadings and cross-loadings

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	AL	BI	SE	HI	IK	NS	IP
AL1	**0.82**	0.38	0.24	0.30	0.40	0.44	0.42
AL2	**0.79**	0.38	0.36	0.28	0.48	0.52	0.44
AL3	**0.83**	0.37	0.34	0.30	0.43	0.40	0.43
BI1	0.38	**0.90**	0.46	0.34	0.49	0.57	0.40
BI2	0.38	**0.92**	0.43	0.41	0.52	0.64	0.39
BI3	0.50	**0.87**	0.43	0.47	0.62	0.61	0.51
SE1	0.31	0.36	**0.78**	0.29	0.35	0.30	0.37
SE2	0.31	0.43	**0.62**	0.23	0.40	0.44	0.42
SE3	0.24	0.34	**0.76**	0.23	0.33	0.26	0.35
SE4	0.29	0.31	**0.83**	0.26	0.35	0.28	0.33
SE5	0.28	0.28	**0.85**	0.29	0.33	0.29	0.38
SE6	0.36	0.37	**0.74**	0.22	0.35	0.38	0.25
SE7	0.26	0.41	**0.79**	0.30	0.34	0.23	0.29
SE8	0.26	0.32	**0.80**	0.26	0.32	0.23	0.32
HI2	0.34	0.42	0.35	**0.96**	0.54	0.33	0.31
HI3	0.35	0.45	0.30	**0.96**	0.53	0.35	0.72
IK1	0.47	0.52	0.42	0.45	**0.82**	0.47	0.50
IK2	0.41	0.56	0.37	0.50	**0.85**	0.43	0.53
IK3	0.41	0.48	0.40	0.46	**0.85**	0.42	0.52
IK4	0.49	0.46	0.35	0.45	**0.81**	0.51	0.54
NS1	0.51	0.61	0.42	0.39	0.54	**0.88**	0.49
NS2	0.51	0.63	0.36	0.32	0.51	**0.93**	0.44
NS3	0.54	0.62	0.38	0.31	0.50	**0.94**	0.47
NS4	0.53	0.64	0.38	0.29	0.50	**0.94**	0.46
IP1	0.39	0.26	0.35	0.20	0.47	0.40	**0.76**
IP2	0.43	0.32	0.34	0.24	0.47	0.39	**0.81**
IP3	0.43	0.35	0.37	0.23	0.47	0.40	**0.83**
IP4	0.36	0.39	0.34	0.21	0.47	0.39	**0.82**
IP5	0.43	0.45	0.35	0.31	0.51	0.40	**0.78**
IP6	0.48	0.37	0.35	0.21	0.45	0.42	**0.77**
IP7	0.43	0.40	0.32	0.29	0.45	0.34	**0.68**
IP8	0.32	0.37	0.31	0.21	0.44	0.27	**0.68**
IP9	0.41	0.43	0.42	0.29	0.55	0.44	**0.77**

The variance inflation factor for measuring altruism, community identification, information platform characteristics, self-efficacy, social interaction ties, and the information-sharing intention was less than 3.3, as shown in Table 4. This model has no common method variance issues [55].

Table 4. Variance Inflation Factors (VIFs)

	Information Sharing Intention	Disaster Information Sharing
Altruism	1.599	
Community Identification	2.306	
Information Platform Characteristics	1.865	
The intention of Sharing Information		1.000
Disaster Information Sharing		
Self-efficacy	1.395	
Social Interaction Ties	1.493	

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3.1.2. Hypothesis Testing

Partial Least Squares Structural Equation Modeling (PLS-SEM) was used to test the model in this study by calculating the constructs [51]. The hypotheses were tested by evaluating the significance of the structural path in the PLS analysis based on path coefficient and t-statistics. This research adopted a two-tail hypothesis test because the relationship of the direction of the hypothesis is not certain yet. This research used a significance level of 0.05; two-tailed tests commonly used for critical values are 1.96.

Table 5. Summary of hypothesis

	Path Coefficient	T-Statistics (|O/STERR|)	P Values	Significance	Support for Hypothesis
H1: Altruism → the Intention of sharing information	0.31	5.09**	0.0000	Significance	Yes
H2: Self Efficacy → the Intention of sharing information	0.11	2.25*	0.0248	Significance	Yes
H3: Social interaction ties → the Intention of sharing information	0.03	0.53	0.5939	Insignificance	No
H4: Community identification → the Intention of sharing information	0.23	2.84**	0.0047	Significance	Yes
H5: Information Platform Characteristics→ the Intention of sharing information	0.12	2.22*	0.0265	Significance	Yes
H6: The intention of sharing information → Disaster information sharing	0.67	18.50**	0.0000	Significance	Yes

Table 6 shows each path's standardized path coefficient estimates and their significant levels (based on t-values). All hypotheses are supported at the α = 0.05 or 0.01 except for Social Interaction Ties. Table 4 indicates that two hypotheses are supported based on the p-value of 0.05, considered moderately significant, and the three are supported with the p-values of 0.01, indicating that they are highly significant. One hypothesis was rejected because the p-Value is more than 0.1, which is insignificant.

3.2. Discussion

3.2.1. Key Findings

This section discusses the findings and implications of the research. The result section shows that three hypotheses are supported with high significance, and two with moderate significance. The details about why certain hypotheses are accepted while others are rejected will be discussed in this section.

Altruism became the most significant factor affecting someone's intention to share disaster information (H1: β=0.31, t=5.09, p=0.0000). People tend to help others without expecting anything in return and are willing to share disaster information, so that disaster victims can get help as soon as possible. Similarly, findings from [9] suggest that people are more eager to share their information when they want to support others with identical information demands or are concerned about humanitarian activities.

The following hypothesis with significant results is Self-efficacy. Someone with high self-efficacy is more motivated to help others during a disaster (H2: β =0.23, t=2.84, p=0.0248). This result is consistent with the findings from prior studies. Someone with strong self-efficacy is more likely to help others than those with low self-efficacy [44]. Bandura also states that self-efficacy greatly influences an individual's willingness to help others [52].

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Nevertheless, Social Interaction Ties have an insignificant influence on the intention of sharing disaster information. This hypothesis was rejected because the relationship between members on Twitter did not affect an individual's intention to share disaster information (H3: β =0.01, t=0.53, p=0.5939). In the same vein, a previous study found that those with similar interests are not necessarily willing to share information with others. People tend to be selective in retweeting or sharing [53].

Community identification was confirmed to be a powerful predictor of the intention of sharing disaster information on Twitter (H4: β =0.01, t=0.53, p=0.0047). People in one community with particular common interests share their personal feelings and daily experience with others [39]. Moreover, people who have the same interests, goals, objectives, and beliefs will respond similarly in a similar situation [13]. In our current study, we found that people in one community with the same interest in disaster events are more likely to have the intention to share disaster information with others.

While this research also examined whether information platform characteristics affect the intention of information sharing, the result obtained is as follows (H5: β=0.12, t=2.22, p=0.0265). Information platform characteristics have an essential role in disaster information sharing. As an information platform, Twitter is a real-time platform that enables disaster information to spread quickly [6]. Furthermore, Twitter can provide timely, reliable, and accurate information and makes its users have the intention to share disaster information. People who know the importance of the information platform characteristics will be encouraged to share disaster information more easily.

Finally, the intentions of Twitter users significantly influence disaster information-sharing behavior (H6: β =0.67, t=18.50, p=0.0000). Twitter users' willingness to share information might be higher if they have the intention to do so. This intention is affected by their eagerness to help others without expecting anything in return, their ability to share information, and their community, and all of these are supported by Twitter as a platform.

3.2.2. Theoretical Implications

The current research provides a contribution to the literature, especially in terms of understanding information-sharing behavior during disasters. We are proposing three theoretical implications based on the results of this study. First, regarding the role of personal factors such as self-efficacy and altruism, we extend these bodies of literature by showing an estimated impact on the intention of sharing information and, later, on information-sharing behavior. Our findings highlight users' need to feel knowledgeable and competent with domain-specific knowledge to stimulate writing and discussion about a disaster that is currently occurring on Twitter. The sincerity of individuals in helping others during a disaster is a predictor of personal factors, which are considered to be the primary influence in shaping the users' information-sharing behavior [11].

The second theoretical implication is related to our differing findings on Social Interaction Ties. The relationship between members on Twitter who arguably have a shared interest in disaster topics was not necessarily a reason for them to share disaster information tweets. This fact indicates that individuals are very selective in their decision to tweet and retweet [56, 57].

Third, the previous studies do not offer any results based on an empirical investigation of the impact of information platforms on sharing disaster information. Meanwhile, the current study analyzes various aspects of information platform characteristics (accessibility, timeliness, sustainability, interoperability, and relevance). The result of this study has provided new insight into how Twitter as an information platform can provide timely, reliable, sustainable, and relevant information, so that Twitter users have the intention to share disaster information.

3.2.3. Practical Implications

Government has a vital role in disaster management, and Twitter users who provide live disaster information on-site have a good reciprocal relationship. This study offers a few practical implications; the higher level of self-efficacy leads to increased disaster information sharing because they will feel confident in doing a task. Twitter users will frequently share disaster information because they have the ability to do that. Altruism is another personal factor that influences disaster information sharing; that

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is, a Twitter user will be willing to help the affected residents in a disaster situation by disseminating information, which would enable the government to provide help to disaster victims more quickly. More in-depth knowledge seems to be needed; community identification is a significant predictor of disaster information sharing. The government is expected to make a partnership with the disaster information-sharing community. They are supposed to encourage people to share more disaster information.

Information platforms have an essential role in disaster information sharing. Twitter, as an information platform, is a real-time enabled platform that allows disaster information to spread quickly. People who know the importance of the information platform will be encouraged to share disaster information. Twitter has made information widely available; it has the ability to collect, analyze, and disseminate information efficiently. Furthermore, Twitter can facilitate the dissemination of information in any form, so that it can be used anytime. Twitter also provides practical, flexible, and responsive information.

3.2.4. Limitations and Future Research

The limitation of this study is that the collected data is cross-sectional, and the sample was obtained from a questionnaire of Twitter users who experienced a disaster. This fact suggests that they may have the intention to share disaster information. However, a Twitter user who has never experienced a disaster has the possibility to share disaster information. Therefore, our findings are not applicable to people who have never experienced a disaster. This limitation would leads us to do more investigation in a future research to know whether Twitter users who have never experienced a disaster are more likely to share disaster information. Furthermore, we can add additional constructs in the personal factors such as empathy and personal outcome expectation, and in environmental factors, norms of reciprocity.

4. Conclusion

This study discovered that various variables affect an individual's willingness to share disaster information. These variables are Altruism, Self-efficacy, Community Identification, and Information Platform. Furthermore, an individual who has the intention to share disaster information are more likely to share information about the disaster. By disseminating disaster information on Twitter, the community can help the government accelerate the disaster management and recovery process and improve the effectiveness of Twitter for disaster information sharing. Besides, it helps raise people's awareness of the current environmental conditions, so that they would be prepared for possible disasters, and they can warn others in disaster-prone areas to be cautious about certain conditions.

Author Contributions

R. N. S. Amriza: Writing, Original-draft Preparation, Methodology. K. N. M. Ngafidin: Review and Editing, Collecting Data. W. Ratnasari: Validating.

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Appendix

Table 6. Research Instrument

Altruism		
Item	Statements	Source
AL1	I like helping others	Hsu and Lin [13]
AL2	If I post disaster Information on Twitter when a disaster occurs, it can help others.	Hsu and Lin [13]
AL3	I enjoy helping other people	Hsu and Lin [13]
Community Identification		
Item	Statements	Source
IK1	Participating in posting disaster tweets would improve our opportunity to meet other Twitter users with similar interests.	Hsu and Lin [13]
IK2	Twitter users maintain a close relationship with others, which is a communication channel for sharing disaster information.	Hsu and Lin [13]
IK3	Twitter users have a strong sense of 'one group.'	Hsu and Lin [13]
IK4	Twitter user is so proud to become Member	Hsu and Lin [13]
Social Interaction Ties		
Item	Statements	Source
HI2	Twitter users maintain deep social ties with their followers	Lu and Yang [46]; Chiu, Hsu, and Wang [12].
HI3	Twitter users frequently interact with their followers	Lu and Yang [46]; Chiu, Hsu, and Wang [12].
Information Platform		
Item	Statements	Source
IP1	Twitter enables information easy to access	Wixom and Todd [47].
IP2	Twitter gave me access to all the data that I needed	Wixom and Todd [47].
IP3	Twitter makes information easily available to me.	Wixom and Todd [47].
IP4	Sharable data and information are provided by Twitter	Van de Walle and Comes [15]
IP5	Twitter answered my information needs in a timely manner	Wixom and Todd [47].
IP6	Twitter will promptly reply to my request	Wixom and Todd [47].
IP7	Twitter delivers immediate information.	Wixom and Todd [47].
IP8	Twitter provides historical information, and data can be retrieved for emergency management and assessment for emergency agencies.	Van de Walle and Comes [15]
IP9	Twitter provides realistic, adaptable, responsive information-driven by operational demands that supports decision-making across all phases of a crisis.	Van de Walle and Comes [15]
Self-Efficacy		
Item	Statements	Source
SE1	I could post disaster information using Twitter if there was someone giving me step-by-step instructions	Compeau and Higgins [45]
SE2	I could post-disaster information using Twitter if there was no one around to tell me what to do as I go	Compeau and Higgins [45]
SE3	I could complete post-disaster information using Twitter if I had only the manual for the reference	Compeau and Higgins [45]
SE4	I could complete post-disaster information using Twitter if I had seen someone else using it before trying it myself	Compeau and Higgins [45]
SE5	I could complete post-disaster information using Twitter if I could call someone for help me get started	Compeau and Higgins [45]
SE6	I could complete post-disaster information using Twitter if I had a lot of time to complete the job	Compeau and Higgins [45]

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SE7	I can post-disaster information using Twitter if I can use the Twitter help center	Compeau and Higgins [45]
SE8	I could complete post-disaster information using Twitter if someone showed me how to do it first	Compeau and Higgins [45]
	Information Sharing Intention	
Item	Statements	Source
NS1	I plan to post-disaster information on Twitter	Ahmad, Zani, and Hashim [9]; Chen and Chen [54].
NS2	I will probably share the disaster information with others	Ahmad, Zani, and Hashim [9]; Chen and Chen [54].
NS3	I am trying to tell people about the disaster information	Ahmad, Zani, and Hashim [9]; Chen and Chen [54].
NS4	I intend to share my knowledge of the disaster with others.	Ahmad, Zani, and Hashim [9]; Chen and Chen [54].
	Information Sharing	
Item	Statements	Source
BI1	I frequently spend my time informing people about the disaster.	Chen and Chen [54].
BI2	I typically actively disseminate my information about the disaster with others	Chen and Chen [54].
BI3	I generally react to other people's remarks on my disaster message.	Chen and Chen [54].

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Research article

The Impact of Personal, Environmental, and Information Platform Factors on Disaster Information Sharing on Twitter

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ABSTRACT

Twitter has become a major platform for disseminating disaster news, providing people with disaster information quickly and precisely. A lot of essential and valuable information can be obtained from this online platform. Twitter users might be able to help with warnings and submit specific and accurate information in a disaster situation. This research attempts to examine factors that affect disaster information-sharing behavior. Furthermore, this study aims to integrate personal, environmental, and information platform factors to gain more insight into the factors influencing Twitter users' willingness to share disaster information. The hypotheses were tested using Partial Least Squares Structural Equation Modeling (PLS-SEM). The result showed that Altruism, Self-efficacy, Community Identity, and Information Platforms significantly influence people's decisions to share disaster information on Twitter.

1. Introduction

Natural disasters occur worldwide, and they happen very often [1]. The world risk report reveals that of 171 countries, developing countries have a higher risk of the occurrence of a natural disaster [2]. Indonesia is located geographically in the pacific ring of fire, in the two-lane mountain ranges where natural disasters frequently occur. This geographical location has several implications, including earthquakes, volcanic activities, and eruptions in various Indonesian islands. In addition, Indonesia is located in the convergence boundaries between three tectonic plates, the Eurasian Plate, the Pacific Plate, and the Indo-Australian Plate, which move rapidly, causing Indonesia to experience multiple earthquakes and tsunamis. Meanwhile, as an archipelagic country located on the equator, Indonesia has two seasons, namely, the rainy and dry seasons. This condition makes Indonesia prone to potential hydro-meteorological disasters and heavy rains that can cause floods, landslides, and prolonged droughts.

In the first three weeks of 2021, 185 disasters happened in Indonesia. Most of them were floods, earthquakes, and landslides. Indonesia recorded at least 297 disasters in January last year, including floods in Jakarta. However, this year's disasters are more destructive than the previous one, in which 166 people lost their lives in January 2021, significantly higher if compared to 91 deaths due to natural disasters in January 2020. Natural disasters are common in Indonesia as the archipelago sits on the

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Pacific Ring of Fire. In addition, the severity of the disasters is also affected by forest destruction and climate change [3].

Social Media have an essential role in information management in this twenty-first century. They have a vital role in all stages when natural disasters occur, through which many people actively send and receive information [4]. People use social media innovatively during disasters for specific purposes. When a disaster occurs or after the disaster ends, people use social media to collect, share and disseminate information [5]. Twitter is one of the social media platforms for sharing information, especially for disasters [6, 7]. Twitter has become a more prominent interest for government authorities and first responders in Indonesia as a communication platform for disaster management. For example, BNPB, as an emergency agency, frequently informs the public about post-natural disaster management, then provides information about the impacts that may emerge as an outcome of the disaster. For example, it broadcasts whether there were casualties, the number of victims, as well as the levels of damage caused to housing, residential areas, public facilities, and infrastructures [7]. Twitter produces timely information when a disaster occurs from Twitter users at the disaster site who know the crucial situation. Twitter users might potentially monitor warnings and submit more specific or accurate information by sharing the disaster information on the platform, further supporting authorized organizations during a disaster. By obtaining recent information, relevant government organizations can provide timely support to residents. Furthermore, information shared on Twitter has a significant impact on disaster management.

According to social cognitive theory, learning occurs in a social situation with a dynamic and bidirectional interaction between the individual, environment, and behavior [8]. Personal factors can influence an individual's assessment of the external environment and the choice to act in any behavior. Meanwhile, altruism is also considered the primary factor that shapes the users' behavior. Furthermore, the environmental factor is among the various factors influencing a person's behavior [14]. In addition, social interaction ties and community identifications are parts of environmental factors that influence personal factors and behaviors.

Previous studies primarily focused on individual and environmental factors in sharing information [9,10,11], but disaster information sharing on social media was rarely discussed. Furthermore, humanitarian information management is crucial in information-sharing behavior because it is essential for coordinating the humanitarian response [15]. The quicker a humanitarian can gather, analyze, and spread critical information, the more effective the response will be, and more lives can possibly be saved. Moreover, as an information platform, Twitter also significantly impacts information sharing. Twitter provides timely, reliable, and accurate information during a crisis. As a real-time platform, Twitter enables traditional journalists and "citizen journalists" to deliver quick situation reports [6]. Therefore, this research examines the characteristics of an information platform that serves as a part of humanitarian information management, and this focus makes this research different from other previous studies.

This research utilizes the social cognitive theory and information platform characteristics in disaster information sharing. This research aims to combine personal, environmental, and characteristics of information platform factors to better understand which factors affect Twitter users to share disaster information the most. By understanding the factors that impact the dissemination of disaster information, stakeholders or governments can influence communities to assist in disaster information sharing, so that disaster management can be carried out quickly and precisely.

2. Theoretical Background and Research

2.1. Theoretical Background

Social Cognitive Theory

The social cognitive theory discusses the relationship between personal and environmental factors and individual behavior [8]. It offers a critical viewpoint for examining why people embrace certain attitudes [9]. For example, Oh and Syn [10] apply the theory to investigate the influential factors that motivate

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dynamic and enthusiastic involvement in sharing information. Their research looks at what drives users to share their personal experiences, information, and social support with others on social media.

Kim, Lee, and Elias [11] analyze the interaction effects of personal and environmental factors on information sharing on social media. Further, Chiu, Hsu, and Wang [12] identify the reasons underlying the information-sharing behavior in virtual networks. Moreover, Hsu and Lin [16] use the social cognitive theory to analyze why blog users (bloggers and readers) are involved in blog activities. Personal factors in the social cognitive theory can be associated with cognitive, emotional, or biological traits that influence an individual's perceptions and behaviors [14]. According to Oh and Syn [10], altruism is the most influential motive for which individuals actively seek and share information with others to answer questions. Altruism is defined as a person's willingness to improve the welfare of others without expecting any reward [10, 13]. As a predictor of Information-sharing intention, altruism is regarded as one of the essential factors influencing user behavior. Meanwhile, community identification and Social Interaction Ties are the environmental factors influencing personal factors and behavior.

The environmental factor refers to the conditions that might influence a person's behavior. Community identification emphasizes the impression of belonging to a specific community [10, 13]. Social media users may develop attachments to specific forms of social media they regularly use [13, 17]. Social Interaction Ties describe the strength of connections, the amount of time used, and the frequent communication between members of online communities [12].

Twitter as an Information Platform to Share Humanitarian Information

Humanitarian information is essential in creating practical humanitarian assistance, coordination, and decision-making during a disaster [18]. Disaster information is sometimes difficult to obtain because of the lack of accessibility of the impacted region, the loss of communication infrastructure, and the remoteness of the impacted area [19]. In the absence of information, humanitarian organizations typically rely on standard emergency supplies such as equipment for communications, shelter, residential, storage, kitchen equipment, water logistics, food, cleaning and sanitation items and devices, material handling equipment, and electrical power supply equipment [20].

Humanitarian information is typically not given by the affected community but comes from various sources, including social media, media exposure, and other responder groups already on site. Social media, particularly Twitter, a massively popular media platform used during disasters [21, 22, 23, 24], attracts attention for sharing information. Therefore, Twitter has a big role in sharing disaster information.

Over the last ten years, humanitarian information principles have been created to guide the processes of gathering, verifying, sharing, and utilizing information [15]. There are 14 principles in humanitarian information management; they are accessibility, inclusiveness, interoperability, accountability, verifiability, relevance, objectivity, humanity, timeliness, sustainability, confidentiality, reciprocity, reliability, and impartiality.

2.2. Research Framework and Hypotheses

This research was carried out to investigate the behavior of Twitter users when sharing disaster information. In this research, the hypotheses are evaluated using PLS-SEM. Figure 1 shows the applied model in this research.

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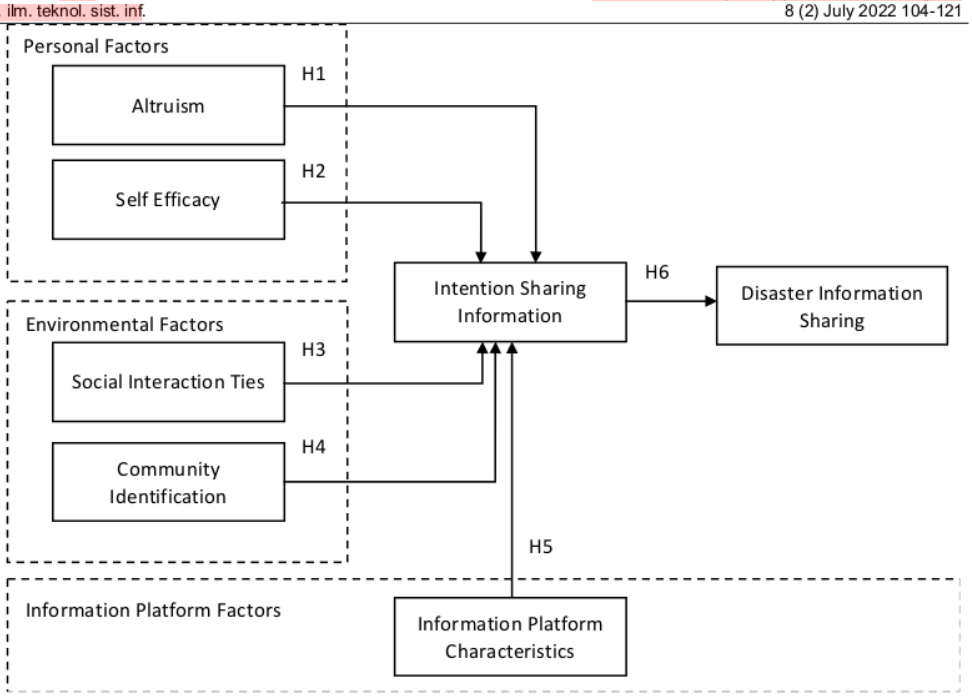

Figure 1. Research framework

Altruism refers to providing something to someone without expecting anything in return [10]. Through motivation studies involving information sharing on social media, altruism is one of the most widely studied components [13, 25, 26]. Altruism has a direct and significant impact on information sharing on the internet [27]. Moreover, altruism is one component that has a significant influence compared to other intrinsic components in tacit knowledge sharing [28]. Furthermore, altruism greatly impacts brand groups on online social networking sites [29].

Moreover, Oh [30] found that altruism is the most significant motivation in which individuals actively seek information and share it with others to answer questions. Furthermore, altruism is likely to be associated with the intention of sharing disaster information on Twitter because Twitter users are more likely to help others without expecting a reward or return. As a result, the following hypotheses are developed:

H1: Altruism affects the intention of sharing information

Self-Efficacy is the ability to perform and complete tasks [31] and is commonly used to understand knowledge-sharing behavior [32]. [11] state that the ability to share information with others is necessary for sharing information on social networking sites; individual efforts to conduct the activity are higher and more persistent as perceived self-efficacy increases. A person's ability to do a task is needed in sharing information, so self-efficacy is also needed [9]. Furthermore, victims with greater self-efficiency frequently show more positive behavior during a disaster, particularly concerning helping others [33, 34], so people with a strong sense of self-efficacy are more willing to share disaster information with others. As a result, the following hypothesis emerges:

H2: Self Efficacy affects the intention of sharing information.

Previous researchers [12, 35, 36] mention Social Interaction Ties in their respective research. Social Interaction Ties refer to the impersonal arrangement of relationships between members of a social

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network and the degree to which they are linked to one another [12]. Tsai and Ghoshal [37] view Social Interaction Ties as information and resource flow routes. The Social Interaction Ties among Twitter users, in this case, individuals who share the information with their followers, may allow cost-effective access to a broader range of information resources. Therefore, the hypothesis is presented as follows:

H3: Social Interaction Ties affect the intention of sharing information.

Prior studies find that social media users consider identifying communities when sharing information. The essence of social media being a place where people gather together, communicate with each other, and establish communities is represented by community identification [10]. Ridho [38] found that community participation positively impacts tourism sustainability and satisfaction. Furthermore, Hsu and Lin [13] found that their community identification highly impacted a blog participant's desire to continue using blogs; users were eager to write because of their community identification. Moreover, people in one community on Twitter have particular common interests and share their personal feelings and daily experience [39]. Hence, Twitter users with the same interest in disaster events will intend to share the disaster information with others on social media. Furthermore, the following hypothesis is proposed:

H4: Community identification affects the intention of sharing information

Information management is essential during a crisis or disaster because it is essential for international humanitarian response coordination [15]. During a crisis, gathering and disseminating fast, trustworthy, and accurate information is crucial for enhancing humanitarian response, optimizing resources and reducing human suffering. The faster a humanitarian can gather, evaluate, and distribute critical information, the more successful the response will be, and the more lives will be saved. According to Kongthon et al. [6], the information generated when flooding occurred was particularly timely because these Twitter users were present in the region and understood what had been happening during crucial conditions. Citizens might potentially monitor warnings and submit more specific or accurate information to support authorized organizations during a disaster. By accessing recent information, associated government organizations might utilize it with requests for assistance to provide timely support to the impacted residents. As a real-time platform, Twitter enables traditional journalists and "citizen journalists" to update situations quickly. Therefore, as an information platform that can provide timely, reliable, and accurate information, Twitter is expected to make its users have the intention to share disaster information. Thus, the following hypothesis is proposed:

H5: Information platform characteristics affects the intention of sharing information.

Behavioral intention has previously been demonstrated to be significantly related to actual behavior [40]. Behavioral intentions are a source of motivation that evaluates how hard people are willing to strive to accomplish a behavior. It is based on the TPB (theory of planned behavior), which assumes that distinct voluntary behavior is a person's desire to act in a certain way [41]. The TPB's core principle is that a person's desire to behave directly predicts their intended behavior. The intention is predicted by three constructs: attitude, subjective norm, and perceived behavioral control [42]. Java et al. [39] found that one of the main user intentions in Twitter posts is to share information, and about 13% of all the posts from Twitter users are for information sharing. Therefore, Twitter users will share disaster information with others because they intend to share it. Hence, the following hypothesis is suggested:

H6: The intention of sharing information affects sharing information behavior.

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2.3. Research Method

The research framework was developed from a literature review of a previous study. Personal and environmental factors are widely used by researchers in studies related to knowledge or information sharing [9, 11, 43]. Personal and environmental factors are directly related to individuals in disseminating information. Furthermore, Twitter as a platform also has an influential role in information sharing; Twitter provides timely, reliable, and accurate information during the crisis. Moreover, there have been no comprehensive studies examining information platforms in disaster information sharing. Therefore, this research develops the previous studies, which were primarily focused on spersonal and environmental factors, by adding one more factor: the information platform.

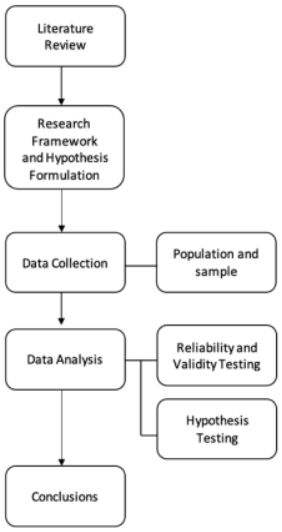

Figure 2. Research stages

The research stages are shown in Figure 2. This research is divided into five stages; literature review, research framework and hypothesis formulation, data collection, data analysis, and conclusion.

2.4. Research Instrument

2.4.1. Literature Review

This research was initiated with a literature study; in this stage, the researchers reviewed the literature on previous research related to disaster information sharing on social media. The social cognitive theory and humanitarian information management theory were the main two theories in this research; that is, personal and environmental factors and information platform characteristics from humanitarian information management can influence disaster information sharing on social media.

2.4.2. Research Framework

After analyzing the theory about disaster information sharing on social media, the next step is developing a research framework and formulating hypotheses. The research framework builds on the theory studied in the literature review. The research instrument was designed based on the theoretical framework. Furthermore, the research instrument was utilized to formulate hypotheses.

2.4.3. Instrument

This research investigates the factors that influence disaster information sharing. The research instrument was developed based on related previous studies. The dependent variables in this study are altruism and self-efficacy from personal factors, Social Interaction Ties, community identification from environmental factors, and information platform characteristics factors. Altruism is devotion to the welfare of others, so it is relevant to this study because Twitter users would like to help others without expecting anything in return. [10]. Some may believe that people should help each other.

Some studies state that self-efficacy is important in information sharing [32, 44, 45]. This factor is needed in this research because the ability of individuals to perform tasks is essential. The context of this research is the ability to share disaster information.

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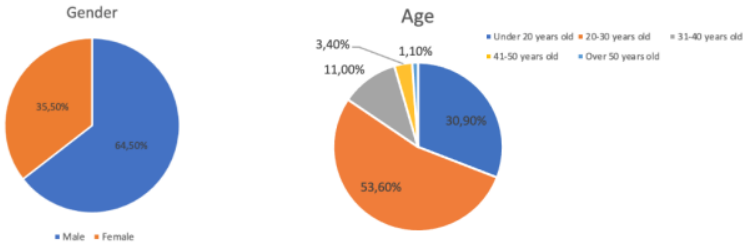
Information-sharing activities may bring together a group of people interested in a particular issue, help build a community, foster community identity, and stimulate a range of activities within the community. People may have the same interest in disaster events and share the information with those with the same interest.

Social Interaction Ties are relationships between members in virtual communities in terms of time spent and communication frequency [12]. These constructs were adopted because social interaction ties among Twitter users may enable more cost-effective access to a larger number of information sources. Regarding Twitter as an information platform, the investigation of accessibility, timeliness, sustainability, interoperability, and relevance should be done. The possible explanation is the characteristic of Twitter itself; it provides timely, reliable, and accurate information, and as a platform, it supports the disaster information-sharing process.

2.4.4. Data Collection and Participants

The questionnaire was administered online through Twitter, Facebook, Instagram, and online chatting groups, such as Line and WhatsApp. The participants who filled in the questionnaire were Twitter users in Indonesia. The data was collected on May 19th, 2021. There were 30 initial sample data used for validity and reliability testing. After it was ensured that the data was valid and reliable, the questionnaire was administered on a larger scale until May 25th, 2021.

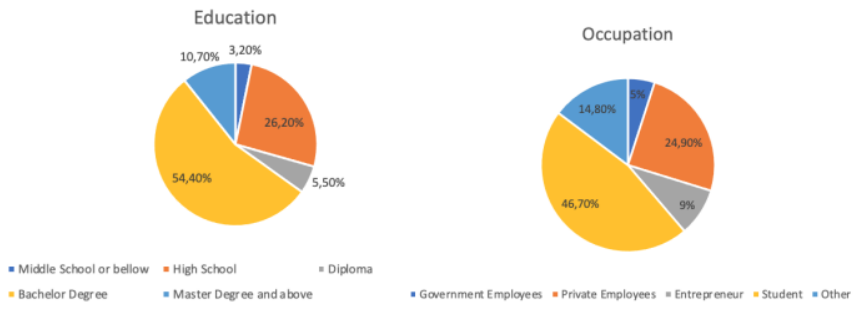
There were 366 responses collected, but only 286 responses were eligible to be analyzed. Figure 3 below shows the participants' characteristics according to their demographics.



(a) (b)

Figure 3. (a) Participants' gender; (b) Participants' ages

Figure 3 presents the participants' ages, mainly ranging from 21 to 30 years old, and the majority were female. The participants' educational levels ranged from SMP (Middle School Students) or lower to master's degree or higher, and they came from different occupations (Figure 4). According to the graph above, the participants consist of diverse groups of individuals, and the information acquired from the participants might be a valuable addition to the community. As shown in the graph, age is not a barrier for people to share disaster information; it shows that the participants are diverse in terms of their ages, ranging from below 20 to over 50 years old.



(a) (b)

Figure 4. (a) Participants' education; (b) Participants' occupations

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2.4.5. Measures

The measurement items mainly were adapted from previous related studies in the virtual community and were modified to fit the disaster information sharing on Twitter. Altruism was measured using three items, which were adapted from Hsu and Lin [13]. Self-efficacy was measured with eight items from Compeau and Higgins [45]. Lu and Yang proposed two Items for measuring Social Interaction Ties. Furthermore, community identification was measured using four items adapted from Hsu and Lin [13]. Information platform characteristics are grounded on accessibility, inclusiveness, interoperability, verifiability, relevance, timeliness, and sustainability [29]. The Information platform characteristics were measured with nine items, three from Van de Walle and Comes [15], and the other six were adapted from Wixom and Todd [47]. The information-sharing intention was measured using four items from Ahmad, Zani, and Hashim [9] as well as Chen and Chen [54]. Disaster information sharing was measured using three items adapted from Chen and Chen [54]. All the items were measured using a 6-point Likert scale: 1 - Strongly disagree, 2 – Disagree, 3 - Somewhat disagree, 4 - Somewhat agree, 5 – Agree, 6 -Strongly agree. Details of items and their sources are given in the Appendix.

2.4.6. Data Analysis

The initial stage of the data analysis process is validity and reliability testing. Cronbach's alpha and composite reliability were used in the data reliability test. Cronbach's alpha measures internal consistency and how closely related item sets are as a group. Meanwhile, composite reliability measures consistency in scale items [48]. The validity testing of this research uses Average Variance Extracted (AVE) to evaluate convergent validity.

This research is based on a cross-section survey; therefore, testing for the quality of formative constructs is needed; it assesses collinearity diagnosis and the significance of formative items. Variance inflation factors not greater than 3.3. for each variable shows that there is no problem with common method variance [47].

The last part of this data analysis is hypothesis testing; Hypothesis testing was carried out using Partial Least Squares Structural Equation Modeling (PLS-SEM). The hypotheses were tested by observing the results of significant values based on the path coefficient values and t-statistics. This study uses a significant level of 0.05 and a critical value of 1.96 [48].

3. Results and Discussion

3.1. Results

3.1.1. Measurement Model

The initial step of this research was testing the reliability and validity of the data. For measuring internal consistency, Cronbach's alpha was used for reliability testing. It observes the close relationship between items as a group. Hair et al. [48] state that the absolute value of 0.7 to 0.9 is commonly used as acceptance criteria. All of the constructs have a value of more than 0.7. The other method to test reliability is composite reliability (CR). Composite reliability measures all latent variables exceeding the recommendation threshold of 0.7, with the lowest value being 0.85 from altruism, as shown in Table 1.

The data validation is calculated using convergent validity; if the items are loaded at a level larger than 0.6, it points out that the error variance has less shared variability than construct and measure [49]. To evaluate the convergent validity, we used the Average Variance Extracted (AVE), where a loading value of more than 0.50 is recommended to justify the use of the construct [48].

Table 1. Reliability and validity of the convergent result

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Construct	Cronbach's alpha	CR	AVE	Item	Outer Loading	Mean	SD
Altruism	0.75	0.85	0.66	AL1	0.82	5.08	0.92
				AL2	0.79	4.87	1.11
				AL3	0.83	5.16	0.91
Community Identification	0.85	0.90	0.70	IK2	0.82	4.37	1.26
				IK2	0.85	4.61	1.16
				IK3	0.85	4.41	1.30
				IK4	0.81	4.64	1.23
Social Interaction Ties	0.88	0.96	0.92	HI2	0.96	3.80	1.41
				HI3	0.96	3.57	1.45
Information Platform Characteristics	0.92	0.93	0.56	IP1	0.76	5.34	0.91
				IP2	0.81	5.39	0.86
				IP3	0.83	5.42	0.83
				IP4	0.82	5.05	1.01
				IP5	0.78	4.46	1.21
				IP6	0.77	4.95	1.03
				IP7	0.68	4.28	1.20
				IP8	0.68	4.72	1.09
				IP9	0.77	4.90	1.05
Self-efficacy	0.907	0.92	0.60	SE1	0.78	4.30	1.31
				SE2	0.62	4.44	1.30
				SE3	0.76	4.39	1.34
				SE4	0.83	4.19	1.35
				SE5	0.85	3.91	1.48
				SE6	0.74	4.49	1.23
				SE7	0.79	3.80	1.46
				SE8	0.80	4.03	1.47
The Intention of Sharing Information	0.94	0.96	0.86	NS1	0.88	4.72	1.20
				NS2	0.93	4.54	1.23
				NS3	0.94	4.72	1.14
				NS4	0.94	4.66	1.17
Disaster Information Sharing	0.88	0.92	0.81	BI1	0.90	3.85	1.39
				BI2	0.92	3.89	1.39
				BI3	0.87	4.22	1.37

Discriminant validity is determined by the square root of each construct's average variance (AVE); and inter-construct correlation. The results, as presented in Table 2, satisfy the discriminant validity because each construct exceeds all respective inter-construct correlations. The second method is analyzing cross-loading items [50]; the loading of the items of each construct was higher than their loadings in other constructs stated in Table 3. The outcome indicates that the items for each construct did not correlate with another construct.

Table 2. Discriminant validity

	AL	BI	SE	HI	IK	NS	IP
AL	**0.81**						
BI	0.46	**0.90**					
SE	0.39	0.49	**0.77**				
HI	0.36	0.46	0.34	**0.96**			
IK	0.54	0.60	0.46	0.56	**0.83**		
NS	0.56	0.67	0.67	0.42	0.55	**0.92**	
IP	0.53	0.48	0.48	0.46	0.63	0.50	**0.75**

Table 3. Loadings and cross-loadings

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	AL	BI	SE	HI	IK	NS	IP
AL1	**0.82**	0.38	0.24	0.30	0.40	0.44	0.42
AL2	**0.79**	0.38	0.36	0.28	0.48	0.52	0.44
AL3	**0.83**	0.37	0.34	0.30	0.43	0.40	0.43
BI1	0.38	**0.90**	0.46	0.34	0.49	0.57	0.40
BI2	0.38	**0.92**	0.43	0.41	0.52	0.64	0.39
BI3	0.50	**0.87**	0.43	0.47	0.62	0.61	0.51
SE1	0.31	0.36	**0.78**	0.29	0.35	0.30	0.37
SE2	0.31	0.43	**0.62**	0.23	0.40	0.44	0.42
SE3	0.24	0.34	**0.76**	0.23	0.33	0.26	0.35
SE4	0.29	0.31	**0.83**	0.26	0.35	0.28	0.33
SE5	0.28	0.28	**0.85**	0.29	0.33	0.29	0.38
SE6	0.36	0.37	**0.74**	0.22	0.35	0.38	0.25
SE7	0.26	0.41	**0.79**	0.30	0.34	0.23	0.29
SE8	0.26	0.32	**0.80**	0.26	0.32	0.23	0.32
HI2	0.34	0.42	0.35	**0.96**	0.54	0.33	0.31
HI3	0.35	0.45	0.30	**0.96**	0.53	0.35	0.72
IK1	0.47	0.52	0.42	0.45	**0.82**	0.47	0.50
IK2	0.41	0.56	0.37	0.50	**0.85**	0.43	0.53
IK3	0.41	0.48	0.40	0.46	**0.85**	0.42	0.52
IK4	0.49	0.46	0.35	0.45	**0.81**	0.51	0.54
NS1	0.51	0.61	0.42	0.39	0.54	**0.88**	0.49
NS2	0.51	0.63	0.36	0.32	0.51	**0.93**	0.44
NS3	0.54	0.62	0.38	0.31	0.50	**0.94**	0.47
NS4	0.53	0.64	0.38	0.29	0.50	**0.94**	0.46
IP1	0.39	0.26	0.35	0.20	0.47	0.40	**0.76**
IP2	0.43	0.32	0.34	0.24	0.47	0.39	**0.81**
IP3	0.43	0.35	0.37	0.23	0.47	0.40	**0.83**
IP4	0.36	0.39	0.34	0.21	0.47	0.39	**0.82**
IP5	0.43	0.45	0.35	0.31	0.51	0.40	**0.78**
IP6	0.48	0.37	0.35	0.21	0.45	0.42	**0.77**
IP7	0.43	0.40	0.32	0.29	0.45	0.34	**0.68**
IP8	0.32	0.37	0.31	0.21	0.44	0.27	**0.68**
IP9	0.41	0.43	0.42	0.29	0.55	0.44	**0.77**

The variance inflation factor for measuring altruism, community identification, information platform characteristics, self-efficacy, social interaction ties, and the information-sharing intention was less than 3.3, as shown in Table 4. This model has no common method variance issues [55].

Table 4. Variance Inflation Factors (VIFs)

	Information Sharing Intention	Disaster Information Sharing
Altruism	1.599	
Community Identification	2.306	
Information Platform Characteristics	1.865	
The intention of Sharing Information		1.000
Disaster Information Sharing		
Self-efficacy	1.395	
Social Interaction Ties	1.493	

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3.1.2. Hypothesis Testing

Partial Least Squares Structural Equation Modeling (PLS-SEM) was used to test the model in this study by calculating the constructs [51]. The hypotheses were tested by evaluating the significance of the structural path in the PLS analysis based on path coefficient and t-statistics. This research adopted a two-tail hypothesis test because the relationship of the direction of the hypothesis is not certain yet. This research used a significance level of 0.05; two-tailed tests commonly used for critical values are 1.96.

Table 5. Summary of hypothesis

	Path Coefficient	T-Statistics (|O/STERR|)	P Values	Significance	Support for Hypothesis
H1: Altruism → the Intention of sharing information	0.31	5.09**	0.0000	Significance	Yes
H2: Self Efficacy → the Intention of sharing information	0.11	2.25*	0.0248	Significance	Yes
H3: Social interaction ties → the Intention of sharing information	0.03	0.53	0.5939	Insignificance	No
H4: Community identification → the Intention of sharing information	0.23	2.84**	0.0047	Significance	Yes
H5: Information Platform Characteristics→ the Intention of sharing information	0.12	2.22*	0.0265	Significance	Yes
H6: The intention of sharing information → Disaster information sharing	0.67	18.50**	0.0000	Significance	Yes

Table 6 shows each path's standardized path coefficient estimates and their significant levels (based on t-values). All hypotheses are supported at the $\alpha = 0.05$ or 0.01 except for Social Interaction Ties. Table 4 indicates that two hypotheses are supported based on the p-value of 0.05, considered moderately significant, and the three are supported with the p-values of 0.01, indicating that they are highly significant. One hypothesis was rejected because the p-Value is more than 0.1, which is insignificant.

3.2. *Discussion*

3.2.1. Key Findings

This section discusses the findings and implications of the research. The result section shows that three hypotheses are supported with high significance, and two with moderate significance. The details about why certain hypotheses are accepted while others are rejected will be discussed in this section.

Altruism became the most significant factor affecting someone's intention to share disaster information (H1: β=0.31, t=5.09, p=0.0000). People tend to help others without expecting anything in return and are willing to share disaster information, so that disaster victims can get help as soon as possible. Similarly, findings from [9] suggest that people are more eager to share their information when they want to support others with identical information demands or are concerned about humanitarian activities.

The following hypothesis with significant results is Self-efficacy. Someone with high self-efficacy is more motivated to help others during a disaster (H2: β =0.23, t=2.84, p=0.0248). This result is consistent with the findings from prior studies. Someone with strong self-efficacy is more likely to help others than those with low self-efficacy [44]. Bandura also states that self-efficacy greatly influences an individual's willingness to help others [52].

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Nevertheless, Social Interaction Ties have an insignificant influence on the intention of sharing disaster information. This hypothesis was rejected because the relationship between members on Twitter did not affect an individual's intention to share disaster information (H3: β =0.01, t=0.53, p=0.5939). In the same vein, a previous study found that those with similar interests are not necessarily willing to share information with others. People tend to be selective in retweeting or sharing [53].

Community identification was confirmed to be a powerful predictor of the intention of sharing disaster information on Twitter (H4: β =0.01, t=0.53, p=0.0047). People in one community with particular common interests share their personal feelings and daily experience with others [39]. Moreover, people who have the same interests, goals, objectives, and beliefs will respond similarly in a similar situation [13]. In our current study, we found that people in one community with the same interest in disaster events are more likely to have the intention to share disaster information with others.

While this research also examined whether information platform characteristics affect the intention of information sharing, the result obtained is as follows (H5: β=0.12, t=2.22, p=0.0265). Information platform characteristics have an essential role in disaster information sharing. As an information platform, Twitter is a real-time platform that enables disaster information to spread quickly [6]. Furthermore, Twitter can provide timely, reliable, and accurate information and makes its users have the intention to share disaster information. People who know the importance of the information platform characteristics will be encouraged to share disaster information more easily.

Finally, the intentions of Twitter users significantly influence disaster information-sharing behavior (H6: β =0.67, t=18.50, p=0.0000). Twitter users' willingness to share information might be higher if they have the intention to do so. This intention is affected by their eagerness to help others without expecting anything in return, their ability to share information, and their community, and all of these are supported by Twitter as a platform.

3.2.2. Theoretical Implications

The current research provides a contribution to the literature, especially in terms of understanding information-sharing behavior during disasters. We are proposing three theoretical implications based on the results of this study. First, regarding the role of personal factors such as self-efficacy and altruism, we extend these bodies of literature by showing an estimated impact on the intention of sharing information and, later, on information-sharing behavior. Our findings highlight users' need to feel knowledgeable and competent with domain-specific knowledge to stimulate writing and discussion about a disaster that is currently occurring on Twitter. The sincerity of individuals in helping others during a disaster is a predictor of personal factors, which are considered to be the primary influence in shaping the users' information-sharing behavior [11].

The second theoretical implication is related to our differing findings on Social Interaction Ties. The relationship between members on Twitter who arguably have a shared interest in disaster topics was not necessarily a reason for them to share disaster information tweets. This fact indicates that individuals are very selective in their decision to tweet and retweet [56, 57].

Third, the previous studies do not offer any results based on an empirical investigation of the impact of information platforms on sharing disaster information. Meanwhile, the current study analyzes various aspects of information platform characteristics (accessibility, timeliness, sustainability, interoperability, and relevance). The result of this study has provided new insight into how Twitter as an information platform can provide timely, reliable, sustainable, and relevant information, so that Twitter users have the intention to share disaster information.

3.2.3. Practical Implications

Government has a vital role in disaster management, and Twitter users who provide live disaster information on-site have a good reciprocal relationship. This study offers a few practical implications; the higher level of self-efficacy leads to increased disaster information sharing because they will feel confident in doing a task. Twitter users will frequently share disaster information because they have the ability to do that. Altruism is another personal factor that influences disaster information sharing; that

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is, a Twitter user will be willing to help the affected residents in a disaster situation by disseminating information, which would enable the government to provide help to disaster victims more quickly. More in-depth knowledge seems to be needed; community identification is a significant predictor of disaster information sharing. The government is expected to make a partnership with the disaster information-sharing community. They are supposed to encourage people to share more disaster information.

Information platforms have an essential role in disaster information sharing. Twitter, as an information platform, is a real-time enabled platform that allows disaster information to spread quickly. People who know the importance of the information platform will be encouraged to share disaster information. Twitter has made information widely available; it has the ability to collect, analyze, and disseminate information efficiently. Furthermore, Twitter can facilitate the dissemination of information in any form, so that it can be used anytime. Twitter also provides practical, flexible, and responsive information.

3.2.4. Limitations and Future Research

The limitation of this study is that the collected data is cross-sectional, and the sample was obtained from a questionnaire of Twitter users who experienced a disaster. This fact suggests that they may have the intention to share disaster information. However, a Twitter user who has never experienced a disaster has the possibility to share disaster information. Therefore, our findings are not applicable to people who have never experienced a disaster. This limitation would leads us to do more investigation in a future research to know whether Twitter users who have never experienced a disaster are more likely to share disaster information. Furthermore, we can add additional constructs in the personal factors such as empathy and personal outcome expectation, and in environmental factors, norms of reciprocity.

4. Conclusion

This study discovered that various variables affect an individual's willingness to share disaster information. These variables are Altruism, Self-efficacy, Community Identification, and Information Platform. Furthermore, an individual who has the intention to share disaster information are more likely to share information about the disaster. By disseminating disaster information on Twitter, the community can help the government accelerate the disaster management and recovery process and improve the effectiveness of Twitter for disaster information sharing. Besides, it helps raise people's awareness of the current environmental conditions, so that they would be prepared for possible disasters, and they can warn others in disaster-prone areas to be cautious about certain conditions.

Author Contributions

R. N. S. Amriza: Writing, Original-draft Preparation, Methodology. K. N. M. Ngafidin: Review and Editing, Collecting Data. W. Ratnasari: Validating.

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Appendix

Table 6. Research Instrument

	Altruism	
Item	Statements	Source
AL1	I like helping others	Hsu and Lin [13]
AL2	If I post disaster Information on Twitter when a disaster occurs, it can help others.	Hsu and Lin [13]
AL3	I enjoy helping other people	Hsu and Lin [13]
	Community Identification	
Item	Statements	Source
IK1	Participating in posting disaster tweets would improve our opportunity to meet other Twitter users with similar interests.	Hsu and Lin [13]
IK2	Twitter users maintain a close relationship with others, which is a communication channel for sharing disaster information.	Hsu and Lin [13]
IK3	Twitter users have a strong sense of 'one group.'	Hsu and Lin [13]
IK4	Twitter user is so proud to become Member	Hsu and Lin [13]
	Social Interaction Ties	
Item	Statements	Source
HI2	Twitter users maintain deep social ties with their followers	Lu and Yang [46]; Chiu, Hsu, and Wang [12].
HI3	Twitter users frequently interact with their followers	Lu and Yang [46]; Chiu, Hsu, and Wang [12].
	Information Platform	
Item	Statements	rce
IP1	Twitter enables information easy to access	Wixom and Todd [47].
IP2	Twitter gave me access to all the data that I needed	Wixom and Todd [47].
IP3	Twitter makes information easily available to me.	Wixom and Todd [47].
IP4	Sharable data and information are provided by Twitter	Van de Walle and Comes [15]
IP5	Twitter answered my information needs in a timely manner	Wixom and Todd [47].
IP6	Twitter will promptly reply to my request	Wixom and Todd [47].
IP7	Twitter delivers immediate information.	Wixom and Todd [47].
IP8	Twitter provides historical information, and data can be retrieved for emergency management and assessment for emergency agencies.	Van de Walle and Comes [15]
IP9	Twitter provides realistic, adaptable, responsive information-driven by operational demands that supports decision-making across all phases of a crisis.	Van de Walle and Comes [15]
	Self-Efficacy	
Item	Statements	Source
SE1	I could post disaster information using Twitter if there was someone giving me step-by-step instructions	Compeau and Higgins [45]
SE2	I could post-disaster information using Twitter if there was no one around to tell me what to do as I go	Compeau and Higgins [45]
SE3	I could complete post-disaster information using Twitter if I had only the manual for the reference	Compeau and Higgins [45]
SE4	I could plete post-disaster information using Twitter if I had seen someone else using it before trying it myself	Compeau and Higgins [45]
SE5	I could plete post-disaster information using Twitter if I could call someone for help me get started	Compeau and Higgins [45]
SE6	I could complete post-disaster information using Twitter if I had a lot of time to complete the job	Compeau and Higgins [45]

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SE7	I can post-disaster information using Twitter if I can use the Twitter help center	Compeau and Higgins [45]
SE8	I could complete post-disaster information using Twitter if someone showed me how to do it first	Compeau and Higgins [45]
	Information Sharing Intention	
Item	Statements	Source
NS1	I plan to post-disaster information on Twitter	Ahmad, Zani, and Hashim [9]; Chen and Chen [54].
NS2	I will probably share the disaster information with others	Ahmad, Zani, and Hashim [9]; Chen and Chen [54].
NS3	I am trying to tell people about the disaster information	Ahmad, Zani, and Hashim [9]; Chen and Chen [54].
NS4	I intend to share my knowledge of the disaster with others.	Ahmad, Zani, and Hashim [9]; Chen and Chen [54].
	Information Sharing	
Item	Statements	Source
BI1	I frequently spend my time informing people about the disaster.	Chen and Chen [54].
BI2	I typically actively disseminate my information about the disaster with others	Chen and Chen [54].
BI3	I generally react to other people's remarks on my disaster message.	Chen and Chen [54].

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