Gadjah Mada International Journal of Business
Vol. 21, No. 3 (September-December 2019): 242-262

Acceptance and Use of Information Technology: Understanding Information Systems for Indonesia's Humanitarian Relief Operations

Made Irma Dwiputranti,[*a] *Adriyani Oktora,*[a] *Liane Okdinawati*[b] *M Nurkamal Fauzan*[a]
[a]Politeknik Pos Indonesia Bandung, Indonesia
[b]School of Business Management, Institute of Technology Bandung, Indonesia

Abstract: Disaster management includes distributing logistical assistance to disaster victims. The implementation of this distribution must occur at the right time, at an appropriate location, on target and be appropriate to the needs of the victims. This research aims to design an information system to improve the performance of disaster relief operations by managing the information while monitoring and evaluating humanitarian relief operations. Consequently, understanding the primary determinants of user acceptance behavior has become a vital aspect in the successful implementation of the information system. The Unified Theory of Acceptance and Use of Technology (UTAUT) model is a tool to investigate and give a better understanding of the factors that affect the potential users' acceptance and use of an information system. This research used 131 different informants from different groups of potential users to measure performance expectancy, effort expectancy, social influence, and facilitating conditions. The results have shown strong relationships between four aspects of the measurements for the acceptance of all parties involved in humanitarian relief operations.

Keywords: disaster management; humanitarian relief operations; logistics management; distribution; information technology; Unified Theory of Acceptance and Use of Technology (UTAUT).

JEL Classification: H84, D83, M15

*Corresponding author's e-mail: irma_dwiputranti@yahoo.com
ISSN: PRINT 1411-1128 | ONLINE 2338-7238
http://journal.ugm.ac.id/gamaijb

Introduction

A disaster is an event that disrupts a community or society and can be caused by natural or non-natural factors and human factors (UNISDR, 2017). These events impact humans and may cause material or environmental losses, to the extent that the community or society cannot survive using their resources. Indonesia has been named by the United Nations (UN) as the 38th most 'at risk' country for catastrophes. This is because Indonesia is one of the most vulnerable countries, subjected to many natural disasters, because of its unique geographical location on the Pacific Ring of Fire and its geological, hydrological and demographic conditions (United Nations, 2014). In the event of a disaster, the humanitarian relief for the disaster's victims needs to form part of the disaster management efforts. In implementing humanitarian relief operations, all the parties involved must conduct the relevant processes at the right time, at the correct location, on target, and appropriate to the needs of the disaster victims.

Disaster management involves various actors, i.e., the government, NGOs, the community, and private parties. An integrated effort in humanitarian relief operations is an important aspect to allow the operations to be conducted quickly, effectively, and efficiently. The authority, in this case the Indonesian government, often encounters barriers to providing emergency assistance to help the victims and reduce the amount of secondary damage. In this rescue and relief phase, the problem mainly occurs in the distribution process, where disaster victims receive the assistance late or do not receive disaster assistance appropriate to their needs. Because the different parties involved in humanitarian relief operations have diverse roles, different interests, and different expertise, it is challenging to coordinate, share information and work together. The differences among the parties also cause duplication of their efforts and wastes valuable resources.

The Indonesian government has several information systems that act as early warning systems in the preparation stage for disaster management. However, the Indonesian government has not used an information system in the rescue and relief stage. Therefore, the Indonesian government has to develop an effective and efficient humanitarian relief management system to anticipate problems related to the rescue and relief situation. The government can use a coordination system through an information system, as a coordinating medium that can integrate all the parties involved in humanitarian relief operations. Based on this situation, the government needs to develop an information system as a coordination system for humanitarian relief operations to support the distribution, coordination, management, and monitoring of the operations. This information system will use real-time interactive tools for all the parties involved in running the humanitarian aid operation efficiently and transparently. The information system can also be used as a real-time monitoring system by the Indonesian government, as an information dashboard, to assist the government in making reports, and can also be used to inform on the real-time condition of the victims' needs. Figure 1 shows the proposed information system for Indonesia's humanitarian relief operations.

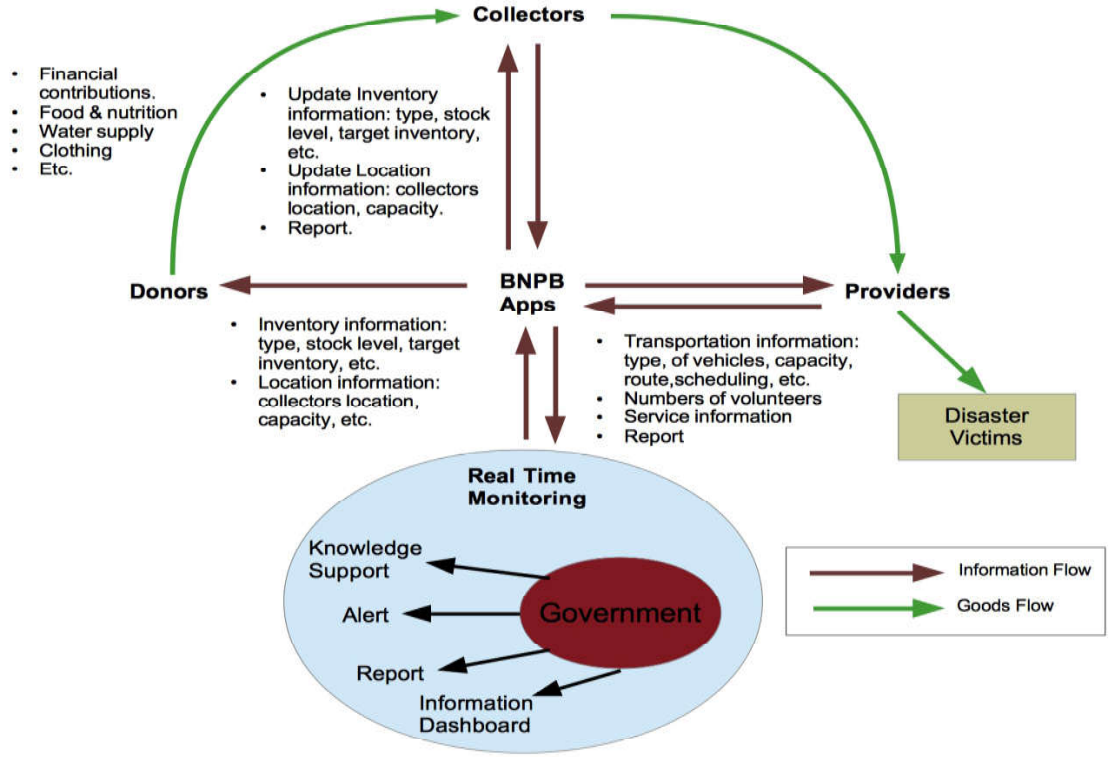


Figure 1. The Information System for Indonesia's Humanitarian Relief Operations

The proposed information system is in line with the United Nations member states declaration at the World Conference on Natural Disaster Reduction in 1994, where it was stated that 'The use of advanced technologies should be available and on time as an integral part of technical cooperation and sharing information and joint disaster relief operations.' However, Singh et al. (2008) state that there is no evidence that information systems can support disaster management systems in a much more effective manner or help in reducing the impact of disasters. Meanwhile, there is a growing need to understand which conditions the parties would adopt the technology under if the Indonesian government insists all the parties involved use the information system. Getting a better understanding of the factors that contribute to the users' acceptance of the information system will exploit the full potential and advantages of the information system.

In order to implement the proposed information system, the government needs to ensure that the proposed information system can be used as a disaster management solution, as planned. Therefore, the prototype for this information system was developed to identify and address problems early on. Moreover, a prototype approach was used to allow all the parties involved to try and test out the information system. Therefore, the purpose of this paper is to capture and analyze the predictors of the Behavioural Intention (BI) and determine what adaptations are necessary to allow the information system to be used for human-

itarian relief operations in Indonesia, based on the information system's prototype. This research used the UTAUT model as a tool to investigate and give a better understanding of the factors affecting the acceptance of potential users of the information system. The result of this research will provide a better understanding of what aspects influence the adoption of an information system for humanitarian aid operations, which is essential for both academicians and practitioners.

Based on the literature review there has been no research on the acceptance of information systems for humanitarian relief operations. Therefore, this research used the UTAUT method to understand which factors might cause all the parties involved in humanitarian relief operations to accept the new technology and to predict the impact that the use of a new information system will have on the attitude and the behavior of the parties. The UTAUT model is an appropriate tool for this research because the UTAUT model integrates eight user acceptance models (Venkatesh et al., 2003) to test the acceptance of the parties involved in Indonesian humanitarian relief operations when using the information system in the future. The use of an acceptance model for prototype information systems was first introduced by Davis and Vankatesh (1989), who used the Technology Acceptance Model (TAM) as a basis for their research with pre-prototype testing. Meanwhile, Resatsch (2010) used UTAUT to capture users' acceptance of the working prototype of two information systems, i.e., *easy meeting*, a meeting room management system, and the *mobile prosumer*, a smart product information system at the point of sale.

The remaining sections of this paper are organized as follows. The second section introduces the related literature. The subsequent two sections describe the research methods and the results with a discussion of the empirical analysis using structural equation modeling. The last section has the conclusion and recommendations for the Indonesian government to increase the adaptation and acceptance of the humanitarian relief information system.

Literature Review

The relevant literature for this research is discussed in this section, based on a review of the extant literature. There are two main areas of literature used in the paper. The first is related to disaster management and the organizational and government efforts to manage the situation, avoid potential losses and reduce the misery of the disaster victims in a disaster area. Then, the next is related to the method used in this research. Finally, an overview of Indonesia's humanitarian relief problems and situations are presented.

Disaster Management

Disaster management is a system for guaranteeing the implementation of adequate and quick disaster relief for disaster victims (Waugh, 2000). The government uses disaster management to ensure rapid and effective recovery and to reduce the loss of life and loss of property. Waugh (2000) also stated that concrete steps for controlling disasters are essential so that the victims can be quickly saved, and all the involved parties can quickly start post-disaster recovery efforts. Kovács and Spens (2009) state that there are two stages in the disaster cycle: pre-disaster, as the risk reduction stage which is divided into the mitigation and preparedness phases; and the response stage when a disaster occurs, which is divided into the res-

cue and relief phase and the recovery phase.

The Law of the Republic of Indonesia No. 24/2007 and National Board for Disaster Management of Indonesia (BNPB) Chief Regulation No. 20/2011 has established monitoring, guidance, and evaluation for the logistics management as a real step in disaster management in Indonesia. The regulations stipulate and control the logistics process for disaster management. The management of logistics covers planning, procurement, warehousing and distribution to the disaster area.

Research related to disaster management in Indonesia is still rare and is done on a small scale. For example, research conducted by Sahilala, Sarwono, and Hanafi (2015) was only related to how district government of Bojonegoro, East Java gives support and helps to flood victims. In this study, they design governance only on a district scale without involving the central government. Meanwhile, according to government regulations, the central government oversaw the distribution of disaster relief. Other studies focus on the framework of factors that influence decision-making in South Asian humanitarian logistics (Roy et al. 2012). Meanwhile, Argollo, Bandeira, and Campos (2013) investigated disaster management to identify the logistics processes and the variables associated with Brazil's disaster management.

Minie et al. (2017) also investigated the distribution processes used by Western Canada for disaster management. Chandes and Paché (2010) investigated the implementation of humanitarian operations in Peru. In addition, Scarpin and Silva (2014) explored and identified the critical factors in Brazil's logistics management. In general, previous studies into disaster management and humanitarian logistics are limited. This has brought disaster management into the limelight, making it a burgeoning academic research field.

Unified Theory of Acceptance in Technology (UTAUT)

For disaster management, during the response time, several parties such as humanitarian organizations work in coordination with other organizations, such as the military, the host government, and local charity organizations, to reduce the suffering of the affected people (Kovács and Spens, 2009). Therefore, the utilization of Information Technology (IT) in humanitarian relief operation's response time is probably a better way to support the distribution, coordination, management, and monitoring of the operation (Delmonteil and Rancourt, 2017).

Given the context and growing interest in developing better solutions for the coordination, distribution, and monitoring of humanitarian relief operations, this research uses a coordination system through an information system as a coordinating medium that can integrate all the parties involved in humanitarian relief operations. Therefore, it is necessary to emphasize how all the parties' beliefs and attitudes influence the process of IT adoption for humanitarian relief operations. Therefore, investigating the users' acceptance of a new information system has a significant role in evaluating and developing a better information system for use in any sector (Venkatesh et al., 2007). Developing an information system prototype is common since a prototype is generally less costly and user-centered. Several previous studies used a prototype of the information system and used UTAUT to determine the technology's acceptance and improve the tested applica-

tion, such as Lubrin et al. (2006), Al-Awadhi and Morris (2008), Resatsch (2010), Al-Otaibi and Wald (2013) and Al-Mansoori (2017).

This research tries to provide a better understanding of which aspects influence the adoption of an information system for humanitarian aid operations, so that it may reveal the interaction between the user and the new information system. The UTAUT model is one of the most desirable models to test the acceptance of the parties involved in Indonesian humanitarian relief operations using the future information system. This research uses the UTAUT model because the UTAUT model re-frames the previous user acceptance model by integrating eight user acceptance models (Venkatesh et al., 2003). Namely, the Theory of Reasoned Action (TRA), the Technology Acceptance Model (TAM), the Motivational Model (MM), the Theory of Planned Behavior (TPB), the Combined Technology Acceptance Model and the Theory of Planned Behaviour (C- TAM-TPB), the Model of PC Utilisation (MPCU), the Innovation Diffusion Theory (IDT), and the Social Cognitive Theory (SCT) (Venkatesh et al., 2003).

The UTAUT model captures four primary elements that determine the intention and usage behavior, which is Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), and Facilitating Conditions (FC) (Venkatesh et al., 2003). Performance expectancy describes users' opinions on the effectiveness of technology (Venkatesh et al., 2003). Within this research's context, where an information system for Indonesia's humanitarian relief operations is the target technology, the extent to which it can help users to capture the effectiveness of the coordination, distribution, and monitoring of the operation, as a proxy of performance expectancy, is what is sought.

Effort expectancy describes users' opinions of the effort or ease of use associated with a technology (Venkatesh et al., 2003). In Indonesia, humanitarian relief operations all the parties involved have different skills and a wide age range. In this research the assumption was made that the elderly users of the information system would not be capable or skilled enough to use the new technology if the new technology is complicated. Therefore, the elderly are not be likely to try the new technology if they perceive that the information system is complicated. This hypothesis is in line with the UTAUT model, where the age of users moderates the relationship between perceived ease of use and the intention to use the technology (Venkatesh et al., 2003).

Social influence describes by Venkatesh et al. (2003) as to how the users of new technology influence others whether they will try to use the new technology or not. In the response stage, to get the information faster, people make active choices and their willingness to engage and participate in humanitarian relief operations is likely influenced by the perceptions or gratitude of the survivors, or even encouraged and advocated by the government. Moreover, this research defines Facilitating Conditions (FC) as the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of new technology (Venkatesh et al., 2003). In this research, FC is the belief that the infrastructure or environment exists to support the humanitarian relief information system.

The UTAUT model has been widely and successfully applied to capture the usage of new technology. Koivumäki et al. (2007) measured the intention of mobile service

application use, and Curtis et al. (2010) observed non-profit organizations' adoption of social media. Meanwhile, Lin and Anol (2008) measured the effect of online social support on network information technology's usage. In addition, Wang et al. (2009) modified the UTAUT model by adding perceived playfulness and the self-management of learning to determine the acceptance of 370 Taiwanese people when using a mobile learning device.

Siswanto, et al. (2011), Kabra et al. (2017), and Orong and Hernandez (2019) used the UTAUT model in their studies. Siswanto et al. (2011) investigated the mitigation disaster website in East Java and Central Java, Indonesia, to capture disaster management documentation and procedures. However, this study only captures the website used for disaster risk reduction efforts. Kabra et al. (2017) attempted to examine the technology adoption behaviour of humanitarian organisations in India. That study only investigated the impact of technology on behavioural intentions, with personal innovativeness as a moderator in humanitarian management. Meanwhile, Orong and Hernandez (2019) measured the acceptance level of the recently launched emergency and disaster response applications in a smartphone in the Philippines. However, their study only captures the technology used for risk assessment, the early warning system, and capacity building for disaster preparedness.

Therefore, there has been no research about the acceptance of the information system in humanitarian relief operations, particularly in Indonesia. Based on the above gaps in UTAUT, this research proposes to test the users' acceptance of the proposed information system's prototype, to ensure the government that the proposed information system could help the coordination system in the event of a disaster.

Indonesia's Humanitarian Relief Case

The Government of the Republic of Indonesia has regulated disaster management in the Republic of Indonesia Law Number 24 of 2007. In the event of a disaster, it is necessary to conduct disaster management. Disaster management here includes distributing logistical assistance to the victims of the disaster, the distribution must be carried out at the right time, at the right location, on target and in accordance with the needs of the victims. This process is known as a humanitarian relief operation. One challenge to humanitarian relief operations in Indonesia is how the process can be done quickly, effectively, and efficiently and also channeled according to the needs of the disaster's victims.

At the time, humanitarian relief operations occur, a few disaster victims often receive assistance when it is too late, or they do not receive assistance according to their needs. This situation is often faced when a disaster happens in Indonesia. Therefore, there is a need for an information system application that can help with the process of the distribution, coordination, management, and supervision of disaster assistance during the relief operation. The government, NGOs, the private sector, and even the wider community expect the application of an information system to improve the performance of disaster management. The application for an information system is expected to be employed as a medium for coordination that can integrate all the parties involved effectively, efficiently and transparently in managing and assisting in the relief effort.

Methods

In this section, the design of the research is presented. The research model, hypotheses, and the collection of the data are discussed.

Research Model and Hypotheses Development

In this paper, the research model used the four primary aspects of the UTAUT model (PE, EE, SI, and FC) as predictors of Behavioural Intention (BI) in the information system for humanitarian relief operations, as seen in Figure 2. It must be noted that while the original UTAUT model also included the actual behaviour or use behaviour, this research did not include those variables in this paper. At the present time, the Indonesian government has not used the information system for Indonesian humanitarian relief operations in a real situation. Therefore, there is no user experience of the information system. The UTAUT model for this paper only focuses on the factors affecting the acceptance of potential users actually using the information system, as seen in the grey shaded area in Figure 2. Based on previous literature and the current disaster management system in Indonesia, this research developed 16 hypotheses to test the users' acceptance of the proposed information system's prototype as the coordinating system in a disaster.

This paper is based on Venkatesh et al. (2003), who supported the idea that the behaviour intention has a direct positive influence on technology's usage, as captured by four primary elements that determine the behavioural intention, which are Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), and Facilitating Conditions (FC). In this paper, performance expectancy is described as the extended benefits that will be received by all parties when using new technology in humanitarian relief operations. Effort expectancy is how easy all the parties find the new information system is to use in a humanitarian relief operation. Social influence is the degree to which all the parties comprehend the information system, to get the information faster likely to be influenced by perceptions or gratitude of the survival or even encourage and advocating by government in disaster condition. Moreover, it is essential to help disaster victims get the appropriate aid quickly. Meanwhile, this research defines facilitating conditions as the extent to which the potential users are sure they can use the information system with their conditions for humanitarian relief operations in an emergency situation.

Hypothesis 1: Performance expectancy has a positive effect on behavioural intention. The first hypothesis has been developed based on the consideration that this paper tried to test if the proposed information system for Indonesian humanitarian relief operations is the appropriate technology to use as the coordinating and monitoring medium to make sure the Indonesian government can operate effectively and efficiently during humanitarian relief operations. Therefore, this paper hypothesises that the performance expectancy significantly influences the different parties' behavioural intention to adopt the information system for humanitarian relief operations.

Hypothesis 2: Effort expectancy has a positive effect on behavioural intention. Different parties will use the Indonesian humanitarian relief information system. Different parties have different skills, experiences and ages. Therefore, these different parties will have different ideas about how easy the proposed information system is to use. The second hypothesis was developed

based on those considerations, which is that effort expectancy (i.e. the operators perceived 'ease of use') is the most important determinant and has a direct and strong influence on the users' behavioural intention to adopt the proposed information system for humanitarian relief operations.

Hypothesis 3: Social influence has a positive effect on behavioural intention. In the response stage, to get information faster, people make active choices and their willingness to engage and participate in a humanitarian relief operation is likely influenced by their perceptions of gratitude from the survivors or by encouragement and advocacy by the government. Therefore, the third hypothesis is developed to test how social pressures, coming from external environments such as the opinions of friends or relatives, affect their perceptions and behaviour when engaging with the information system in disaster situations.

Facilitating conditions defines the degree to which an individual believes that an organisational and technical infrastructure exists to support the use of the new technology (Venkatesh et al., 2003). Therefore, the hypothesis relating to FC in this paper assumes that the users will not be fully committed to using the system if an inadequate infrastructure or environment exists to support the humanitarian relief information system. Consequently, this research proposes the following hypothesis:

Hypothesis 4: Facilitating conditions have a positive influence on behavioural intention. This paper also uses the three moderator variables as variables that may balance the impact of a predictor of intention. The three variables used are the role of the participant (Anne, Matthew, and Richard, 2014), age (Venkatesh et al., 2003), and attitude (Ajzen and Fishbein, 1980; Davis, 1989; Pavlou and Fygenson, 2006). This research chooses the role of the participant variable because all the parties involved in humanitarian operations have different roles. This paper defines the role of the donor as an individual or community that contributes in-kind or in-cash for disaster victims. Meanwhile, this paper defines a provider as a party that ensures the necessary materials and resources are available for the operational processes, a collector as a party that collects donations for disaster relief and a government as the activator who authorises disaster relief operations and mobilises resources to the disaster area. Against this background, it can be hypothesised that in this research the role is one of a moderator who has a positive influence on the four primary elements, i.e., Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), and Facilitating Conditions (FC).

Hypothesis 5: The role of the participants affects the influence of performance expectancy on behavioural intention. These hypotheses have been developed based on the previous arguments that each of the parties involved in a humanitarian relief operation will have a different performance expectancy that will also influence their behavioural intention to use the information system during a disaster.

Hypothesis 6: The role of the participants affects the influence of effort expectancy on behavioural intention. As mentioned earlier, different parties have different skills, therefore they will feel differently about the 'ease of use' of the information system in a humanitarian relief operation. Based on this consideration the sixth hypothesis was developed.

Hypothesis 7: The role of the participants affects the influence of social influence on behavioural intention.

Hypothesis 8: The role of the participants

affects the influence of facilitating conditions on behavioural intention. Each party involved in a humanitarian relief operation has a different external environment and different facilitating conditions. Based on these assumptions the seventh and eighth hypotheses were developed to test if, even though a different role has a different external environment and different facilitating conditions, the role has a positive impact on the behavioural intention to adopt a new system for humanitarian relief operations.

Venkatesh et al. (2003) also stated that age influences peoples' intentions when using technology. This research also uses the age variable to capture whether the difference between 'young' and 'old' users will influence the intention to use the information system for humanitarian relief operations. The relationship between age and performance expectancy in this research refers to the extent to which the age of the user influences them to achieve benefits from the execution of their duties when using the information system for humanitarian relief operations. The relationship with effort expectancy refers to how age influences the level of ease related to the utilisation of the information system during humanitarian relief operations. Meanwhile, the age and social influence relationship refers to the extent to which individuals' ages influence their perception that the people who are close to them, or those who hold important positions in their life, believe that they should try using the information system in humanitarian relief operations. Moreover, age and facilitating conditions refers to the extent to which the age of the individuals influences how certain existing technical and organisational conditions will help them facilitate the use of the information system during humanitarian relief operations. In view of this, this study hypothesises that:

Hypothesis 9: Age affects the influence of performance expectancy on behavioural intention.

Hypothesis 10: Age affects the influence of effort expectancy on behavioural intention.

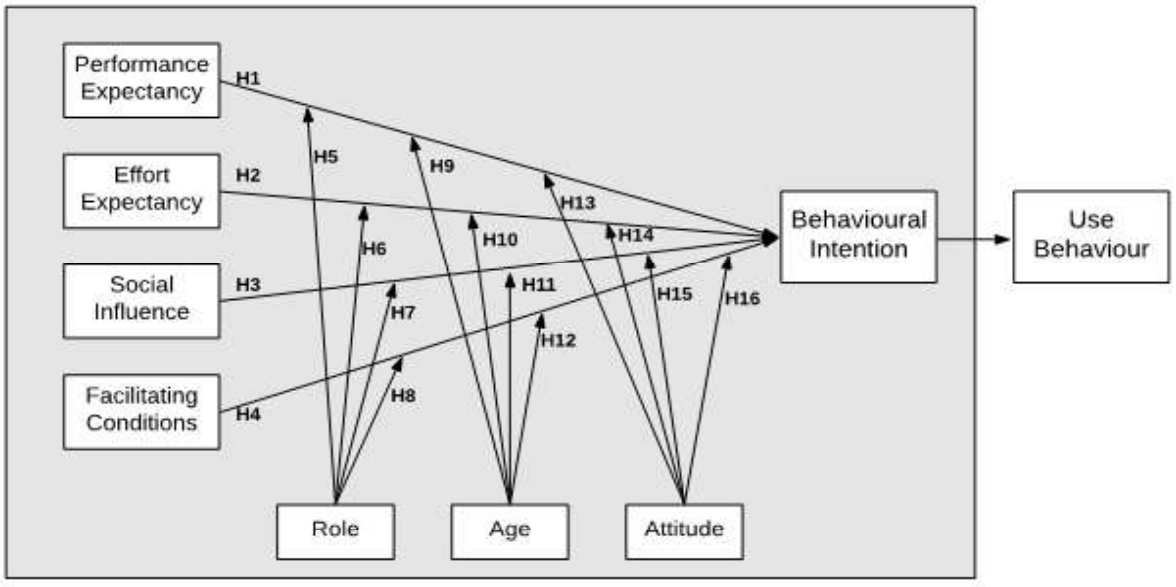
Hypothesis 11: Age affects the influence of social influence on behavioural intention.

Hypothesis 12: Age affects the influence of facilitating conditions on behavioural intention. The attitude variable refers to the potential users' feelings, such as positive or negative feelings about their involvement when using new technology. Previous research (Ajzen and Fishbein, 1980; Davis, 1989; Pavlou and Fygenson, 2006) has tested this relationship, and obtained positive results. Since the previous research found that attitude can influence the intention to use a new system, the attitude variable is also used in this research and developed as a hypothesis to test the potential users' feelings, such as their positive or negative feelings about their involvement in humanitarian operations. Similar to the previous explanation, in this research the attribute variable is assumed to act as a moderator and have a positive influence on the four primary elements, i.e., Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), and Facilitating Conditions (FC). Therefore, it is proposed that:

Hypothesis 13: Attitude affects the influence of performance expectancy on behavioural intention.

Hypothesis 14: Attitude affects the influence of effort expectancy on behavioural intention.

Hypothesis 15: Attitude affects the influence of social influence on behavioural intention.



Source: Adaptation from Venkatesh et al. (2003)

Figure 2. The UTAUT Model of Information System for Indonesian Humanitarian Relief Operations

Hypothesis 16: Attitude affects the influence of facilitating conditions on behavioural intention.

To test the hypotheses a questionnaire was developed to obtain information about the acceptance of the information system from several parties involved in Indonesia's disaster management programme. The data collection will be presented in the next subsection.

Research Method

In order to test the users' acceptance, this research used a prototype of the proposed information system. The prototype was presented and used by the respondents in trials which were conducted two times. This research uses non-probability sampling based on the consideration that this technique is the best fit for this research; by choosing this type of sampling, based on the personal judgment of the researcher, the participants can have different roles in the humanitarian aid operation. In April 2018, the questionnaires were distributed after the respondents had used the prototype. The questions that represent the predictors' and the moderators' aspects are scored using a Likert scale ranging from one (strongly disagree) to five (strongly agree). An open-ended question was also included and used to

Table 1. Questionnaire distribution results

Role of Participant	Number of Questionnaires Distributed	Number of Returned and Valid Responses
Donors	120	93
Providers	25	20
Collectors	25	18
Total	170	131

ask the respondents what their reasons were if they did not choose to use the information system during the emergency situation.

Table 1 captures each sample for each participant. A total of 170 questionnaires were distributed, 131 participants returned the questionnaires and these were considered to be valid and became the final sample's size.

Results and Discussion

This section describes the results of the questionnaire using Structural Equation Modelling (SEM). Then the findings, after testing the information system's prototype using the UTAUT model, are discussed further in the next subsection.

Data Analysis

This research used descriptive statistics using SPSS version 24, to analyze the reliability Cronbach's alpha was used, to analyze the validity the Confirmatory Factor Analysis (CFA) was measured and Structural Equation Modelling (SEM) was also employed. Hinkin (1998) stated that for acceptable reliability, the index for Cronbach's alpha should be set at 0.7 or higher. Moreover, SEM was evaluated to be at least 0.90 Comparative Fit Index (CFI), Root Mean Square Error of Approximation (RMSEA) was set at less than 0.08, and the ratios of chi-square to the degree of freedom ($\chi 2/df$) were set at less than two (Bentler, 2007). The demographic characteristics of the participants can be seen in Table 2. Chi-square tests showed $p < 0.05$, which meant those samples were significantly distributed and met the homogeneity of proportion requirements.

Table 2. Distribution of Three Sample Groups by Gender, Age, and Education

Characteristics	Donors		Providers		Collectors	
	N	%	N	%	N	%
Total Sample	93	71	20	15	18	13.7
Gender						
Male	31	33	13	65	11	61.1
Female	62	67	7	35	7	38.9
Age						
20-30	20	22	6	30	2	11.1
31-40	27	29	5	25	6	33.3
41-50	37	40	7	35	5	27.8
51-60	9	10	2	10	5	27.8
Education						
Bachelor's degree	60	65	8	50	6	33.3
Graduate's degree	33	35	12	75	12	66.7

Confirmatory Factor Analysis (CFA) and SEM Analysis

The proposed model in this paper comprises of four latent independent variables (performance expectancy, effort expectancy, social influence, and facilitating conditions) and one dependent variable (behavioral intention). This paper used Confirmatory Factor Analysis (CFA) to analyze the causal relationships between the latent independent vari-

Table 3. Confirmatory Factor Analysis

Items		Factor Loading	Error Variance	t-value	Individual Item Reliability	Composed Reliability	Average Variance Extracted	Parameter Estimates
Criteria		0.5-0.97	Non-negative	> 1.96	> 0.5	> 0.6	> 0.5	> 1.96
Performance Expectancy (PE)	PE1	0.87	0.21	15.47	0.791			4.48
	PE2	0.79	0.34	13.11	0.624			8.23
	PE3	0.82	0.37	13.48	0.655	0.906	0.662	8.19
	PE4	0.78	0.40	12.53	0.593			8.43
	PE5	0.81	0.38	12.69	0.641			7.19
Effort Expectancy (EE)	EE1	0.81	0.32	13.51	0.671	0.681	0.612	7.45
	EE2	0.67	0.61	9.14	0.572			9.38
Social Influence (SI)	SI1	0.54	0.71	6.83	0.571			8.91
	SI2	0.61	0.65	7.98	0.660	0.711	0.528	8.13
	SI3	0.86	0.24	11.12	0.755			2.42
Facilitating Conditions (FC)	FC1	0.83	0.31	12.89	0.671	0.630	0.517	5.81
	FC2	0.51	0.70	7.56	0.704			9.56
Behavioural Intention (BI)	BI1	0.90	0.18	26.94	0.864			6.97
	BI2	0.94	0.10	26.93	0.922	0.951	0.913	4.69
	BI3	0.91	0.19	20.15	0.801			7.67

ables and dependent variables. Table 3 shows that the CFA results for all the items are within the ideal ranges. In addition, the overall fit of the model is also analyzed and shown in Table 4, where the results met all the criteria.

This research also used the LISREL software program to test the proposed model and to analyze the Structural Equation Modelling (SEM). Byrne (1998) states that LISREL can be used to hypothesize and validate the relations between variables. The results of LISREL, which show the path coefficients and t-values, are presented in Figure 3. Figure 3 shows that all the proposed variables were supported. These results showed that PE, EE, SI, and FC have a significant influence on BI. The results showed that the use of the information system in humanitarian relief operations is positively accepted by all the parties, who believe that it improves performance and thus motivates them to adopt it. For PE (t-value > 1.96 with $p < 0.05$), the government needs to make sure that all the parties involved in humanitarian relief operation can benefit from using the information system.

The result is consistent with the previous model of job fits (Thompson, Higgins, and Howell, 1991) and relative advantage

Table 4. Overall Model Fit of the Proposed Model Adopted from Venkatesh et al. (2003)

Measurement Items	Criteria	Results
$\chi 2$/d.f.(normed chi-square)	< 3	0.90 (Compliant)
Goodness-of-Fit Index (GFI)	> 0.8	0.95 (Compliant)
Adjusted Goodness-of Fit-Index (AGFI)	> 0.8	0.96 (Compliant)
Root Mean-square Residual (RMR)	< 0.05	0.04 (Compliant)

(Moore and Benbasat, 1991). Thompson et al. (1991) capture how the capabilities of a system enhance each party and increase performance for the same amount of effort when using the system. Therefore, the results showed that all the parties accept that the use of an information system in humanitarian relief operations will improve the coordination and monitoring among the parties and the effectiveness of the relief's distribution.

Moore and Benbasat (1991) also state that the parties expect the system will improve the tasks compared to the previous system. Making the information system for humanitarian relief operations easy to use in an emergency is essential to make sure all the parties want to use it as EE (t-value > 2.58 with $p < 0.05$). The result is also in line with previous research, where the perceived ease of use (Davis, 1989; Davis, Bagozzi, and Warshaw, 1989; Moore and Benbasat, 1991) and complexity or difficulty in understanding something (Thompson et al., 1991) are essential factors that influence the behavioral intention of parties to use the new system. In addition, the EE result also shows it has a great influence on behavioral intention because the proposed information system will be the first system used in Indonesia for humanitarian relief operations. This result is consistent with several prior studies, which show that the EE's influence will gradually become less significant after a period of time using the technology (Agarwal and Prasad, 1997; Thompson et al., 1991; Thompson, Higgins, and Howell, 1994).

The SI result shows a t-value of > 3.29 with $p < 0.05$, which means that the SI can increase acceptance of the information system. This result is consistent with research by Ajzen (1991), Davis et al. (1989), Fishbein and Ajzen (1975), Mathieson (1991), Taylor and Todd (1995a, 1995b). Those studies found that certain subjective norms, such as personal perception and the degree to which a new system is perceived to enhance one's image or status in one's social system, are aspects that influence the intention to use a new system. This result is in line with the participants' opinions that most donors tend to use the new information system when their peers or family encourage them to use the new technology. Meanwhile, the providers and collectors have the opinion that they

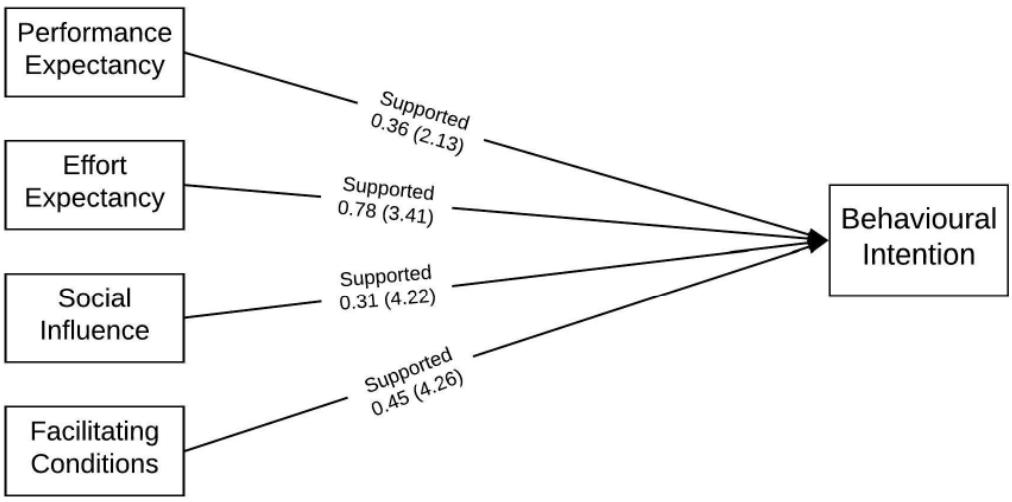


Figure 3. Structural Equation Modelling (SEM) Between The Variables

tend to use the new information system when the government advocates them to use it.

Meanwhile, the FC's result shows a t-value of > 3.29 with $p < 0.05$, the result shows the positive acceptance of the new humanitarian relief information system when the technical infrastructure exists to support the use of the system. Using an information system in a humanitarian relief operation requires specific skills, resources, and infrastructure because of all the parties involved work in a stressful situation. Enhancing the software and hardware of the information system is necessary to ensure that the process runs smoothly. This result was in line with the concern of most of the participants, which was what happens if the implemented information system is not synchronized with the existing system.

The Effects of the Moderators Variables

The hypotheses in this research are developed from the three moderator variables used in the proposed model, i.e., that the role, age, and attitude all affect the relationship between the latent independent variables and the dependent variable as shown in Figure 2. Levene's test, Scheffe's method, a T-test, and ANOVA are used to examine the hypotheses. This research uses Levene's test and Scheffe's method to test the homogeneity of the samples by computing the ratio of variances. Meanwhile, this research uses a T-test and ANOVA to capture if there were significant differences between different sample groups.

The first moderator variable is 'role' wherein this paper all the parties in the humanitarian operations have a different role. This research used three roles, i.e. provider, donor, and collector. Therefore, this research used Scheffe's method as a homogeneity test for various combinations of the populations without equal sample sizes (Chiou, 2006). The results showed that the p-value was > 0.05, which means that there is no significant difference in latent independence among the different roles. Table 5 shows the results of the regression using the 'role' variable as a moderator.

Based on Table 5, all the sample groups pay attention to all the latent independent variables. The provider and collector give more attention to the EE and PE variables than the other variables. No matter what their role in humanitarian relief operations is, they are all concerned about whether the

Table 5. Regression of Behavioural Intention using 'Role' as the Moderator Variable

Role		Provider		Donor		Collector	
Behavioural Intention (BI)	R2 value	0.515		0.416		0.563	
	Coefficient	β	t-value	β	t-value	β	t-value
	Performance Expectancy (PE)	0.524	4.425	0.237	2.591	0.437	4.229
	Effort Expectancy (EE)	0.601	4.703	0.436	4.873	0.689	8.744
	Social Influence (SI)	0.272	2.019	0.625	8.650	0.231	2.653
	Facilitating Conditions (FC)	0.410	4.211	0.280	2.395	0.294	3.783

information system is easy to operate in an emergency situation. On the other hand, the donor pays more attention to SI. This result implies that the 'role' of users moderates the relationship between SI and BI. These results indicate that the role of each party will indirectly influence the relationship between all the latent independent variables (PE, EE, SI, and FC) and BI when using the information system. The results are in line with previous studies. Chang et al. (2007) and Chau and Hu (2001) found that different roles might understand a new system differently and might influence the subjective norms.

The second moderator variable is age. Based on the sample in this research, there are four age ranges of participants, which are age 20 to 30, age 31 to 40, age 41 to 50, and age 51 to 60. Smith and Anderson (2018) from the Pew Research Center state that most people aged around 41-50 and 51-60 have a similar adaptation to technology and social media use. Therefore, the age variable is used to capture whether the difference between 'young' and 'old' users influence the intention to use the information system. Based on Table 2, the four age ranges can be divided into two groups, 'young' is under 40 years old and 'old' is above 40 years old. Based on Levene's test, all the results showed that the p-value was > 0.05, which means that there was no significant difference between the two age groups. Table 6 shows the results of the regression of the age variable as a moderator.

The results showed that 'young' people are more concerned about SI than those people above 40 years old. In other words, 'young' people want to receive the appropriate information faster. Responses from different parties aged above 40 show they are more concerned with EE. This result means that 'old' people are interested in using the information system if the information system is easy to use. In addition, both age groups have concerns about FC, whether the existing facilities can support the information system during an emergency condition.

Table 6. Regression of Behavioural Intention using 'Age' as the Moderator Variable

Age		Young (Under 40)		Old (Above 40)	
Behavioural Intention (BI)	R2 value	0.752		0.465	
	Coefficient	β	t-value	β	t-value
	Performance Expectancy (PE)	0.179	2.214	0.106	0.998
	Effort Expectancy (EE)	0.113	1.437	0.750	7.849
	Social Influence (SI)	0.582	6.245	0.311	5.177

Overall the results showed that the age variable would indirectly influence the relationship between all the latent independent variables (PE, EE, SI, and FC) and BI. The results are relevant to Morris and Venkatesh's (2000) research, where age differences have been shown to exist in technology adoption contexts. Moreover, Plude (1985) also states that the result has shown 'old' people have difficulty in processing complex stimuli and allocating attention to information when using software systems.

The last moderator variable is attitude and refers to the potential users feelings,

such as 'positive' or 'negative' feelings about their involvement in humanitarian operations. Using Levene's test, the results showed that the p-value was < 0.05. This result indicates that the two samples significantly differ in their discreteness. Table 7 shows the results of the regression of the attitude variable as a moderator. The regression results showed that a 'positive' attitude pays more attention to SI to get fast and reliable information. This result also indicates that other people affect users' 'positive' attitudes.

All the sample groups that have a 'negative' attitude show more concern about whether the information system will be easy to use or not. They are skeptical about whether the information system will help humanitarian relief operations, or make them more complicated. As shown in Table 7, the attitude variable moderated the effects of all the latent independent variables (PE, EE, SI, and FC) on BI. The results for the attitude variable are consistent with the research by Ajzen and Fishbein (1980), Davis (1989), and Pavlou and Fygenson (2006), who all found that attitude is one of the predictors of the behavioral intention to use the new system.

Table 7. Regression of Behavioural Intention using 'Attitude' as the Moderator Variable

Attitude		Positive		Negative	
Behavioural Intention (BI)	R2 value	0.634		0.501	
	Coefficient	β	t-value	β	t-value
	Performance Expectancy (PE)	0.397	4.528	0.168	2.014
	Effort Expectancy (EE)	0.269	2.740	0.378	4.519
	Social Influence (SI)	0.662	9.744	0.271	2.850
	Facilitating Conditions (FC)	0.152	2.017	0.299	2.194

Conclusions

This paper investigated the acceptance of the use of a new information system prototype by different groups which are involved in humanitarian relief operations. This research uses the UTAUT model to develop the proposed model. This research also uses descriptive statistics to analyze the reliability using Cronbach's alpha, the validity by measuring the Confirmatory Factor Analysis (CFA), and also Structural Equation Modelling (SEM). The findings in this research indicated that Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), and Facilitating Conditions (FC) are latent variables. Those variables affect the Behavioural Intention (BI) of all the parties who may use the information system in humanitarian relief operations. Effort Expectancy (EE) is the most dominant variable that affects the behavioral intention, as shown in Figure 3, as it has the highest coefficients compared to the other variables.

The proposed model used three moderator variables, i.e., role, age, and attitude. The results also showed that the moderator variables in the proposed model affect the relationships between the four latent variables (PE, EE, SI, and FC) and BI. This result implies that these moderator variables have a certain moderating effect on the relationships between the four latent variables (PE, EE, SI, and FC) and BI.

The government could use the findings of this research to help make all the different parties willing to use the information

system. The government has to ensure that all the aspects related to the latent variables have met the standards expected by the users. The government needs to ensure that all the parties perceive the advantages of using the information system. The government also has to make sure that the information system is easy to use, and all the necessary supporting facilities are ready to be used in an emergency situation. Moreover, the government must consider the influence of the social aspect in increasing the acceptance of the information system. The moderator variables will indirectly influence BI, particularly age and attitude. 'Young' people seem to be more ready to use the information system, as shown by the main concern being about the SI variables, while the possibility that the information system would be difficult to use in an emergency situation worries the 'old' people. This result is relevant to the attitude variable as the moderator variable, as the 'positive' attitude has more concerns about the SI variable while the 'negative' attitude is more worried about the EE variable. Therefore, the government should place more emphasis on the EE variable, supported by the FC variable, to increase the acceptance of the humanitarian relief information system.

Limitation

A limitation of this research is that this research measures acceptance based on the trial of an information system prototype before the respondents get to use the information system in a real situation. Therefore, the results of this research need to be measured again after the respondents have experienced it in an emergency. Furthermore, this paper only used three variables, i.e. role, age, attitude as moderator variables. Further research can use other variables, such as the social trend to use technology and all the different parties' values as moderator variables, to get a clearer understanding of the acceptance of the humanitarian relief information system.

References

Agarwal, R., and J. Prasad. 1997. The Role of Innovation Characteristics and Perceived Voluntariness in the Acceptance of Information Technologies. Decision Sciences 28(3): 557–582.

Ajzen, I. 1991. The Theory of Planned Behavior.*Organizational Behavior and Human Decision Processed* 50.

Ajzen, I., andM. Fishbein. 1980. *Understanding attitudes and predicting social behavior.* Prentice-Hall.

AlAwadhi, S., and A. Morris. 2008. The Use of the UTAUT Model in the Adoption of E-Government Services in Kuwait. In Proceedings of the 41st Annual Hawaii International Conference on System Sciences.

Alotaibi, S. J., and M. Wald. 2013. Evaluation of the UTAUT model for acceptable user experiences in Identity Access Management Systems. In 8th International Conference for Internet Technology and Secured Transactions (ICITST-2013).

Al Mansoori, K.A. 2017. Use of a modified UTAUT model to investigate Emirati Citizens' adoption of e-Government in Abu Dhabi. Thesis, University Of Wollongong.

Anne, K., L. C. Matthew, andB. Richard. 2014. Incorporating UTAUT Predictors for Understanding Home Care Patients' and Clinician's Acceptance of Healthcare Telemedicine

Equipment. *Journal of Technology Management and Innovation* 9(2): 29–41.

Argollo, S., R. Bandeira, andV. Campos. 2013. Operations Research in Humanitarian Logistics Decisions. In *13th World Conference on Transport Research*. Rio de Janeiro.

Bentler, P. M. 2007. On tests and indices for evaluating structural models. *Personality and Individual Differences* 42(5): 825–829.

Byrne, B. M. 1998. *Structural Equation Modeling With Lisrel, Prelis, and Simplis*. Routledge.

Chandes, J., and G. Paché. 2010. Investigating humanitarian logistics issues: From operations management to strategic action. *Journal of Manufacturing Technology Management* 21(3): 320–340.

Chang, I. C., H. G. Hwang, W. F. Hung, and Y. C. Li. 2007. Physicians' acceptance of pharmacokinetics-based clinical decision support systems. *Expert Systems with Applications* 33(2): 296–303.

Chau, P. Y. K., and P. J. H. Hu. 2001. Information Technology Acceptance by Individual Professionals: A Model Comparison Approach. *Decision Sciences* 32(4): 699–719.

Chiou, H. J. 2006. *Quantitative Research and Statistical Analysis in Social and Behavioral Sciences*. Wu-Nan Book Inc.

Curtis, L., C. Edwards, K. L. Fraser, S. Gudelsky, J. Holmquist, K. Thornton, and K. D. Sweetser. 2010. Adoption of social media for public relations by nonprofit organizations. *Public Relations Review* 36(1): 90–92.

Davis, F. D. 1989. Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly* 13(3): 319.

Davis, F. D., R. P. Bagozzi, and P. R. Warshaw. 1989. User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. *Management Science*35(8): 982–1003.

Delmonteil, F. X., and M. E. Rancourt. 2017. The Role of Satelite Technologies in Relief Logistics. *Journal of HUmanitarian Logistics and SUpply Chain Management* 7 (1):57–78.

Fishbein, M., and I. Ajzen. 1975. *Belief, Attitude, Intention, and Behavior : An Introduction to Theory and Research*. Addison-Wesley Pub. Co.

Hinkin, T. R. 1998. A Brief Tutorial on the Development of Measures for Use in Survey Questionnaires. *Organizational Research Methods* 1(1): 104–121.

Kabra, G., A. Ramesh, P. Akhtar, and M. K. Dash 2017. Understanding Behavioural Intention To Use Information Technology: Insights From Humanitarian Practitioners. *Telematics and Informatics*.

Resatsch, F. 2010. Ubiquitous Computing Developing and Evaluating Near Field Communication Applications. Universität München.

Koivumäki, T., A. Ristola, and M. Kesti. 2007. The Perceptions Towards Mobile Services: An Empirical Analysis of The Role of Use Facilitators. *Personal and Ubiquitous Computing* 12(1): 67–75.

Kovács, G., and K. Spens. 2009. Identifying challenges in humanitarian logistics. International *Journal of Physical Distribution and Logistics Management* 39(6): 506–528.

Lin, C.P., and B. Anol. 2008. Learning Online Social Support: An Investigation of Network Information Technology Based on UTAUT. *CyberPsychology and Behavior* 11(3): 268–272.

Lubrin, E., E.Lawrence, A. Zmijewska, K.F. Navarro, and G. Culjak. 2006. Exploring theBenefits of Using Motes to Monitor Health: An Acceptance Survey. International Conference

on Systems and International Conference on Mobile Communications and Learning Technologies.

Mathieson, K. 1991. Predicting User Intentions: Comparing the Technology Acceptance Model with the Theory of Planned Behavior. *Information Systems Research* 2(3): 173–191.

Minie, S. M., M. Gendreau, J. Y. Potvin, J. Berger, A. Boukhtouta, and D. Thomson. 2017. Military three-echelon disaster relief supply chain management. In 2017 *4th International Conference on Information and Communication Technologies for Disaster Management* (ICT-DM):1–8. IEEE.

Moore, G. C., and I. Benbasat. 1991. Development of an Instrument to Measure the Perceptions of Adopting an Information Technology Innovation. *Information Systems Research* 2(3): 192–222.

Morris, M. G., and V. Venkatesh. 2000. Age Differences in Technology Adoptation Decisions: Implcations for a Changing Work Force. *Personnel Psychology* 53(2): 375–403.

Orong, M. Y., and A. A.Hernandez. 2019. User Acceptance of Emergencyand Disaster Response MobileApplication in the Philippines: An Investigation Based on the Unified Theoryof Acceptance and Use of Technology Model. *International Journal of Enterprise Information Systems* 15 (1):85–99.

Pavlou, P. A., and M. Fygenson. 2006. *Understanding and Predicting Electronic Commerce Adoption: An Extension of the Theory of Planned Behavior*.

Plude, J. 1985. Attention and performance : Identifying and localizing age deficits. *IAging and Human Performance* 47–99.

Roy, P., P. Albores, and C. Brewster. 2012. Logistical Framework for Last Mile Relief Distribution in Humanitarian Supply Chains: Considerations from the Field. *In Proceeding of the International Conference on Manufacturing Research (ICMR 2012)*. Birmingham, UK.

Sahilala, M. I., Sarwono, and I. Hanafi. 2015. Tata Kelola Distribusi Bantuan Logistik Korban Bencana Alam (Studi Empiris pada Bencana Banjir di Kabupaten Bojonegoro). *Jurnal Administrasi Publik* 3(5): 812–817.

Scarpin, M. R. S., and R. O. Silva. 2014. Humanitarian Logistics: Empirical Evidences from a Natural Disaster. *Procedia Engineering*78: 102–111.

Singh, S., Gautam, R. Kumar, and V. K. Sharma. 2008. Role of Information and Technologies in Disaster Management. In *National Conference on Architecturing Future IT Systems*.

Taylor, S., and P. Todd. 1995a. Assessing IT Usage: The Role of Prior Experience. *Quarterly* 19.

Taylor, S., and P. A. Todd. 1995b. Understanding Information Technology Usage: A Test of Competing Models. *Information Systems Research* 6(2): 144–176.

Thompson, R. L., C. A. Higgins, and J. M. Howell. 1991. Personal Computing: Toward a Conceptual Model of Utilization. *MIS Quarterly* 15(1).

Thompson, R. L., C. A. Higgins, and J. M. Howell. 1994. Influence of Experience on Personal Computer Utilization: Testing a Conceptual Model. *Journal of Management Information Systems* 11(1): 167–187.

Siswanto, T., R. Shofiati, and H.Hartini. 2017. Acceptance and Utilization of Technology (UTAUT) as aMethod of Technology Acceptance Model of MitigationDisaster Website. *IOP Conf. Series: Earth and Environmental Science* 106.

Smith, A., and M. Anderson. 2018. *Social Media Use in 2018*. Pew Research Center.

UNISDR. 2017. *Integrating Disaster Risk Reduction. Draft Guidance Note*.

United Nations. 2014. *World Risk Report.* Retrieved from www.WorldRiskReport.org

Venkatesh, V., R. H. Smith, M. G. Morris, G. B. Davis, F. D. Davis, and S. M. Walton. 2003. User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly* 27.

Wang, Y.S., M. C. Wu, and H. Y. Wang. 2009. Investigating the determinants and age and gender differences in the acceptance of mobile learning. *British Journal of Educational Technology* 40(1): 92–118.

Waugh, W. L. 2000. *Living with hazards, dealing with disasters : An introduction to emergency management*. M.E. Sharpe.