Assessment of Measurement Indicators of Success Factors of Facebook Use for Flash Flood Disaster Management

Nur Hasniza Illias[1a*], Nurazean Maarop[2], Noor Hafizah Hassan[3], Ganthan Narayana Samy[4], Norziha Megat Mohd Zainuddin[5], Pritheega Magalingam[6], Doris Wong Hui Ten[7]

[1,2,3,4,5,6,7]*Razak Faculty of Technology and Informatics, Universiti Teknologi Malaysia, Kuala Lumpur, Malaysia*
[1]nurhasniza@graduate.utm.my*, [2]nurazean.kl@utm.my, [3]noorhafizah.kl@utm.my, [4]ganthan.kl@utm.my, [5]norziha.kl@utm.my, [6]mpritheega.kl@utm.my, [7]doriswong@utm.my

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*nurhasniza@graduate.utm.my

Abstract

Flash flood is one of the major concern for many countries including Malaysia. Back in December 2021, Klang Valley was severely impacted by an unexpected massive flash flood which not only had wreaked havoc on infrastructure and caused huge losses on assets, but also ironically caused panic within the stakeholders and claimed the lives of the victims. Moving with Industry Revolution (1R) 4.0, social media use for disaster management has been increasingly acknowledged where it allows rapid dissemination of information to necessary parties, improve extensive communication as well as reinforcing information flow. However, there is a limited focus in the current literature on examining the success factors that influence social media use in the context of flash flood disaster management. Based on an extensive literature review, a hybrid IS model is proposed combining DeLone & McLean IS success model and IS theory of adoption (TAM), coupled with Civic Voluntarism Model (CVM) for motivation and flow. The proposed model aims to examine the relationship of selected factors with intention to use and actual use of Facebook towards its impact on community agility. A pilot was conducted via online survey using semi-structured questionnaires distributed via Facebook with 30 successful data collected. Data analysis was further examined with the aid of SPSS and SmartPLS 4.0. Results revealed that Perceived Ease of Use, Perceived Usefulness, Information Quality, System Quality, Emotional Support, Rumour Control, Social Influence, Overall Flow, Intention to Use, Actual Use, Adaptability, Resilience and Proactiveness are reliable factors that can be considered for further research in Facebook use for flash flood management.

Keywords: *Information System Success Model, Social Media, Flash Flood Management*

1. Introduction

Malaysia is expected to be vulnerable to flood risks as a developing nation, depending on its flood mitigation methods, community awareness, and stakeholders' adaptability [1]. Disaster management entails the development and application of measures to avoid catastrophic disasters from inflicting further damage to the economy and infrastructure [2]. Four phases comprise a common and comprehensive approach to disaster management: (i) prevention/mitigation, (ii) readiness, (iii) reaction, and (iv) recovery [3], [4]. In December 2021, the flash flood that slammed Klang Valley with an unexpectedly high magnitude shook the entire nation of Malaysia. The massive flood caused major damage to infrastructure,

* *Corresponding author. nurhasniza@graduate.utm.my*

wreaked chaos in the community and among stakeholders, and took the lives of 48 people, the highest number in the history of flood catastrophes in Malaysia [5]. Many attributed the high number of fatalities, with the majority occurring in Selangor, on the unpredictability of the flood [5]. The disaster provided an entirely fresh viewpoint on how flash flood aftermath could constitute an emergency in Klang Valley.

The advancement of technology has produced innovative concepts for a better-structured flood mitigation method [6]. Social media was identified as a possible informational tool for enhancing the effectiveness of flood disaster management in Klang Valley [1]. Several research have observed a rising tendency in the study of social media success in disaster management [7], [8], [9], and [10]; however, none have focused on flash flood. It was proposed that it is essential to evaluate the appropriate usage of social media in Malaysia for detecting flood victims' needs for assistance and the various stakeholders' offers of assistance [11]. This suggests that effective use of social media in Malaysia's flood disaster management could enhance the response phase [1]. However, the majority of previous studies have primarily focused on the first two phases, and none have examined the four phases of disaster management from a global viewpoint [12]. This study therefore seeks to determine the characteristics that influence the use of Facebook in flash flood control in the Klang Valley.

2. Flash Flood Management

Recent publications on disaster management have undergone a paradigm change in which the initial goal of being flood-free has been replaced with a system of living with floods [13]. Agility is described as the organizational and personal capacity to inspect and monitor events and environmental changes in a timely manner [14]. There are three main components of agility: Adaptability, Resilience, and Proactiveness [14]. As [15] explains, the adaptive and transformative qualities of social members or stakeholders influence the resilience of a society under major environmental shocks. Through research on the success characteristics of multi-hazard platform systems, [16] highlighted that the capacity to share announcements with family and friends influences public preferences. Similarly, [17] indicated that social ties and family ties are undoubtedly powerful factors in assisting victims to deal and recover from a post-flood situation, particularly when there is a delay in obtaining aid from the relevant agencies, which may be indicative of their well-being [18]. Indeed, information sharing among all actors in any emergent event, particularly humanitarian emergencies, might raise the likelihood of achieving information superiority, which can then be converted into tactical and decision superiority [19].

3. Social Media Use in Disaster Management

According to [20], social media is a new sort of media technology that facilitates the creation and distribution of user-generated content within and between organizations and individuals, hence fostering interactivity and co-creation. As technology progresses, social media is becoming more popular and widely used to disseminate and collect information during natural disasters around the world [21],[22]. According to a number of studies, social media is becoming an

increasingly important non-traditional information source during disasters [23]. During times of crisis, when most traditional avenues of communication, such as television and radio, are inaccessible, victims have turned to social media [23]. They found social media to be a valuable venue for connecting people who need assistance coping with loss or who wish to share their story [24]. Similarly, the use of social media is believed to be the sole way to reduce the fear and anxiety of flood victims [25]. When phone lines and all wired media are down as a result of flooding, social media sites such as Facebook and Twitter may be the only way to communicate with loved ones, such as family and close friends [23]. In addition, a recent study by [1] indicated that social media could play a significant role in boosting flood information diffusion, hence aiding in flood disaster management.

Situational awareness (SA) and effective emergency response depend on real-time data sharing [26]. SA in the context of emergency or disaster response refers to participants' or agencies' understanding of "what is happening" during the event. This insight will have an impact on the success of multi-agency coordination as well as the effectiveness and efficiency of the emergency response to any type of disaster [27]. [26] used social media data analysis on Twitter feeds during flood events in the United Kingdom and 2012 Hurricane Isaac to examine how social media technologies improve real-time SA for multi-agency responses. Although non-traditional data sources should not replace traditional sources of emergency management information, [28] argued that they could fill some gaps in traditional reporting by providing sources of information with a high return on investment, so social media should no longer be a secondary thought in emergency and disaster situations. This is because non-traditional data sources can provide near real-time sources of information with a high return on investment.

4. Proposed Model

In this study, we implemented the base theory of information system success from DeLone & McLean where the success factors were determined to produce the net benefit. Figure 1. and Figure 2. shows the Information System Success Model (1992) and Information System Success Model (2003) respectively. As depicts in Figure 1., the causal relationships of Information Quality and System Quality with Use were proposed in this study in the context of social media use for flood disaster management. Consequently, following DeLone & McLean (2003) approach, the success indicator of this study is based on the net benefit which is measured by dependent variable Community Agility [29].

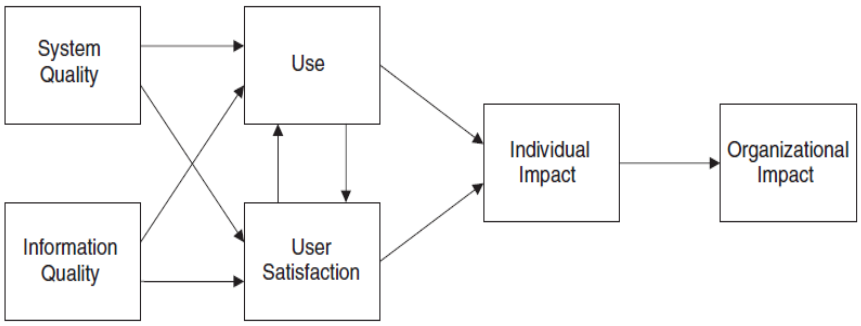

Figure 1. DeLone & McLean Information System Success Model (1992) [29]

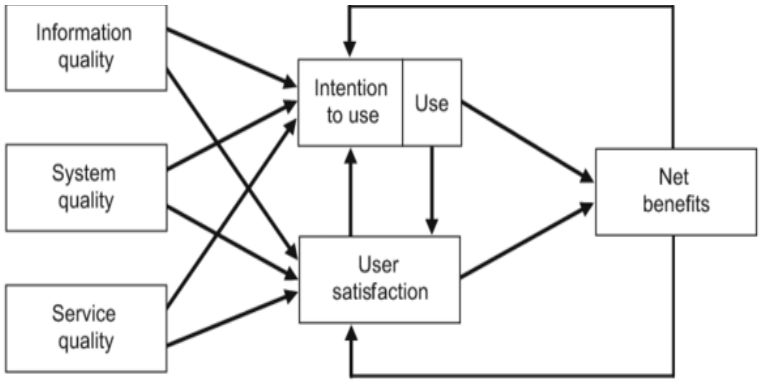

Figure 2. DeLone & McLean Information System Success Model (2003) [30]

In order to develop a conceptual model of social media use in Klang Valley flash flood disaster management, we conducted literature research to determine the success factors of social media use in flood disaster management. On the basis of previous research, a number of factors have been identified that may be relevant to this study. Based on the previous studies, several factors or constructs were found which could be initially considered in the context of this study which are Trust (T), Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Information Quality (IQ), Flow (FL), Emotional Support (ES), Satisfaction (S), Perceived Technology Fit (PTF), Social Demographic (SD), Service Quality (SQ), Relative Advantage (RA), External Pressure (EP), Personal Value (PV), Rumor Control (RC), External Political Efficacy (EPE), Sense of Belonging (SOB), Altruism (A), Expected Relationship (ER), Loyalty (L), Emotion (E) and others. Consequently, apart from considering occurrences of factors in the review, we also conducted another level of selection of factors analysis based on certain criterions and which are: (1) the study must include either social media or disaster management, (2) the study must be conducted above year 2015 and (3) the study must be related to the body of language of success model.

As a result, we identified Trust (T), Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Information Quality (IQ), System Quality (SQ), Flow (FL), Social Influence (SI), Emotional Support (ES), Intention to Use (IU), Actual Use (AU), Adaptability (A), Resilience (R), and Proactiveness (P). Figure 3. outlines the proposed model.

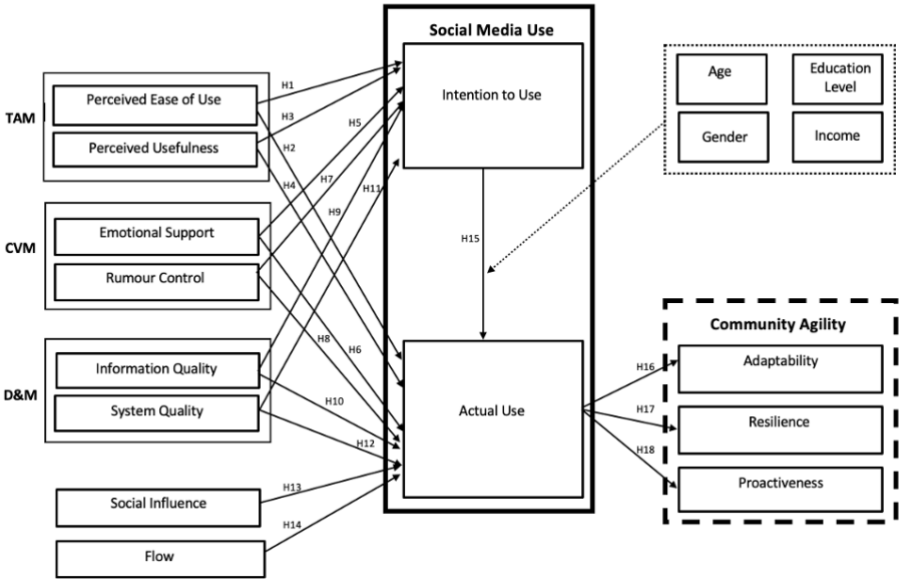

Figure 3. Proposed Model

5. Methodology

The research instrument utilized in this study is a survey questionnaire form that was disseminated online using Google Forms. Most of the measurement of the questionnaires was constructed based on past researches, with necessary alterations made to fit the area of this study. Additionally, the items were designed based on the proposed model factors which consists of eight (8) independent factors, five (5) dependent factors and two (2) moderating factors. The survey comprises of four (4) sections where it starts with moderating factors followed by the independent variables, dependent variables, as well as the net benefits. Moderating factors consist of Social Demographic and Social Economic Status with a total of four (4) items which are Age, Gender, Education Level and Income. Meanwhile, there are eight (8) independent variables comprises of twenty-eight (28) items or questions followed by another eight (8) items representing dependent variable Intention to Use and Actual Use. Lastly, the net benefit items which entail Adaptability, Resilience and Proactiveness are represented by another total of nine (9) questions. The main population of the data collection is Klang Valley citizen who uses Facebook and was affected by flash flood at least once in the area. Demographic information such as flood experience and Facebook user status were collected to ensure accuracy of the data. The instrument was made available online via Facebook groups to reach citizens and was kept active for one week. In ensuring the accuracy of the measurement, content validity initially was performed by having the items reviewed by three (3) experts in the field of IS research. This study implements constructs reliability and validity test using IBM SPSS Statistics version 28.0.1.1 and SmartPLS 4.0. The assessment of the measurement variables was done by examining the internal consistency using Cronbach's alpha (CA) and Composite Reliability (CR) withfour cut off values to measure reliability: i.e. excellent reliability (0.90 and above), high reliability (0.70 - 0.90), moderate reliability (0.50

- 0.70) and low reliability < 0.50. Additionally, convergent validity is examined according to Average Variance Extracted (AVE) above 0.5.

6. Findings

A total of 30 responses were compiled after keeping the Google Form link active for one week. Demographic information such as gender, age, education level and monthly household income were collected. Results revealed that majority of the respondents are female (n=23, 80.0%) while only (n=7, 23.3%) are males. The highest age group is 31 – 40 years old (n=16, 53.3%), followed by 21 – 30 years old (n=10, 33.3%) and 41 – 50 years old (n=4, 13.3%). Most of the respondents have monthly household income below RM2,500 (n=16, 53.3%) while only 10 (33.3%) have income between RM2,501 - RM4,850 and remaining earns between RM4,851 - RM10,970. 30.0% of the respondents graduated with Bachelor's Degree and another 30% with Diploma, whilst the remaining with Sijil Pelajaran Malaysia (SPM) or others. Majority of the respondents were found to use Facebook several times a day (n=16, 53.3%), while others use at least once a day (0.26%) or at least once a week (0.20%). All of the respondents had encountered flash flood at least once in their lifetime with (n=10, 33.3%) of them had experienced the disaster several times.

Table 1. presents the results obtained from SPSS software and by running PLS algorithm using SmartPLS 4.0. From SPSS, the value of initial Cronbach's alpha (CA) was retrieved and examined. An alteration was made to one of the items to obtain higher value of CA. One item from System Quality was deleted to increase System Quality CA value from 0.596 to 0.626 to indicate moderate reliability. Further, PLS algorithm was calculated based on the remaining indicators to retrieve Composite Reliability (CR) and Actual Variance Extracted (AVE) values. It was found that out of 13 indicators tested, 10 of them have excellent reliability (CR > 0.9), 2 of them have high reliability (CR > 0.7) and 1 possess moderate reliability (CR>0.5). Meanwhile, AVE values for all indicators are above 0.5 which indicates convergent validity has been established.

Table 3. Assessment of Measurement Indicators

#	Factor	Item	Original No. of Item	Original CA	Deleted	Modified CA	Modified No. of Item	CR	AVE
1	Perceived Ease of Use (PEOU)	PEOU1, PEOU2, PEOU3, PEOU4, PEOU5	5	0.834	-	0.834	5	0.900	0.627
2	Perceived Usefulness (PU)	PU1, PU2, PU3, PU4	4	0.810	-	0.810	4	0.811	0.643
3	Information Quality (IQ)	IQ1, IQ2, IQ3	3	0.877	-	0.877	3	0.903	0.805
4	System Quality (SQ)	SQ1, SQ2, SQ3	3	0.596	SQ1	0.626	2	0.642	0.726
5	Emotional Support (ES)	ES1, ES2, ES3	3	0.964	-	0.964	3	0.969	0.932
6	Rumour Control (RC)	RC1, RC2, RC3	3	0.913	-	0.913	3	0.923	0.856
7	Social Influence (SI)	SI1, SI2, SI3	3	0.810	-	0.810	3	0.819	0.727
8	Flow (F)	OF1, OF2, OF3, OF4	4	0.891	-	0.891	4	0.906	0.764
9	Intention to Use (IU)	IU1, IU2, IU3, IU4	4	0.938	-	0.938	4	0.948	0.844
10	Actual Use (AU)	AU1, AU2, AU3, AU4	4	0.905	-	0.905	4	0.912	0.785
11	Adaptability (A)	A1, A2, A3	3	0.947	-	0.947	3	0.952	0.908
12	Resilience (R)	R1, R2, R3	3	0.961	-	0.961	3	0.962	0.929
13	Proactiveness (P)	P1, P2, P3	3	0.935	-	0.935	3	0.935	0.885
Total No. of Item			**45**				**44**		

Final test result presents that out of forty-five (45) items tested, forty-four (44) items were found reliable. From the total of thirteen (13) factors, ten (10) are pronounced for having excellent reliability which are Perceived Ease of Use, Information Quality, Emotional Support, Rumour Control, Overall Flow, Intention to Use, Actual Use, Adaptability, Resilience and Proactiveness. Meanwhile, Perceived Usefulness and Social Influence possess high reliability and one (1) factor which is System Quality having moderate reliability. Overall, the result presents a validated indicator variables that should be considered by other upcoming studies that want to quantify the usefulness of using social media for flash flood management.

7. Conclusion

A hybrid IS model for the usage of Facebook for Klang Valley's community agility in managing flash floods is offered in this study. The proposed model, consisting of forty-five (45) items, was further validated and reviewed to provide a modified version including forty-four (44) items, with no changes to the components. After removing one (1) item, the IBM SPSS Statistics software reliability study found that all of the proposed factors are reliable with a minimum reliability of moderate. Perceived Ease of Use, Perceived Usefulness, Information Quality, System Quality, Emotional Support, Rumor Control, Social Influence, Flow, Intention to Use, Actual Use, Adaptability, Resilience, and Proactiveness are the identified variables. Theoretically, this study contributes to the literature by identifying Facebook's role in flash flood disaster management. The final output is a validated instrument that may be utilized for future study on the use of social media for flash flood disaster management in the Klang Valley.

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