

Social Media Crisis Communication Model for Building Public Resilience: A Preliminary Study

Umar Ali Bukar¹[\[https://orcid.org/0000-0002-3983-6919\]](https://orcid.org/0000-0002-3983-6919), Marzanah A. Jabar¹[\[https://orcid.org/0000-0002-3619-5028\]](https://orcid.org/0000-0002-3619-5028), and Fatimah Sidi²[\[https://orcid.org/0000-0001-9556-9045\]](https://orcid.org/0000-0001-9556-9045), and RNH Binti Nor¹[\[https://orcid.org/0000-0001-5099-6692\]](https://orcid.org/0000-0001-5099-6692), and Salfarina Abdullah¹[\[https://orcid.org/0000-0002-8522-9175\]](https://orcid.org/0000-0002-8522-9175)

¹Department of Software Engineering and Information System, Faculty of Computer Science and Information Technology, Universiti Putra Malaysia (UPM), Serdang 43400, Malaysia

²Department of Computer Science, Faculty of Computer Science and Information Technology, Universiti Putra Malaysia (UPM), Serdang 43400, Malaysia

Abstract. There is an ongoing discussion about the effectiveness of social media usage on the ability of people to recover from the crisis. However, the existing social media crisis communication models could not address the dynamic feature of social media users and the crisis, respectively. Therefore, the objective of this study is to conduct a preliminary investigation of the social media crisis communication model for building public resilience. Thus, 34 items were generated from the literature concerning the crisis, crisis response, social interaction, and resilience. The items were validated by three experts via content validity index and modified kappa statistics. After passing the validation test, the instruments were pre-tested by 32 participants. The reliability of the items was analyzed using Cronbach's alpha. Also, the model fits and mediation were examined by the regression model, and the hypotheses were independently assessed in process macro models. Based on the result obtained, each of the constructs satisfied the internal consistency requirement; crisis (0.743), crisis response (0.724), social media interaction (0.716), and resilience (0.827). Furthermore, the result also indicates that the regression model is a good fit for the data. The independent variables statistically significantly predict the dependent variable, $p < 0.05$. Also, the result of the process macro models indicates that all the hypotheses are independently supported.

Keywords: Crisis communication, Social media, Resilience, Social interaction, Crisis response

Introduction

The widespread adoption of technology has enabled crisis response and humanitarian development to be considered the future of human progress and well-being (1). Crisis management is driven by advances in computing, communications, storage, processing, and analysis. Technology-driven emergency management is continuously evolving as a new research field. Each step to improve methods or tools can make a significant contribution to saving human lives and resources. Emergency management, disaster management, and crisis management are often used interchangeably (2). Their role is to coordinate efficient actions related to information dissemination, security, supply, lodging in a highly dynamic and uncertain environment (3). The occurrence of a crisis, in particular, a disaster, is hard to predict, but its effects can be minimized through enabling technologies (4).

Crises come with a rapid increase in communication and a decrease in physical interactions. Coronavirus (Covid-19) is an example of a crisis that has become a threat to interaction

as everyone tries to have little interaction as possible (5)(World Health Organisation [WHO]. Information about the virus is spread on social networking sites which assists situational awareness, stakeholders interactions, and crisis responses (6). Social media enabled groups and individuals to collaborate and engage in crisis communication which also enabled digital convergence of people, information, and resources during crises (7). As a result, the people are far from being passive receivers; they actively seek out crisis information and exchange views with others (8). Hence, the dependence of formal and informal stakeholders (management and public) response is an established requisite for effective crisis communication and management (9; 10). Social media hypothetically intensifies the influence of the public's responses (10).

Therefore, this study aims to investigate the impact of the crisis, crisis response, and social media interaction on community resilience as part of an ongoing study on modeling social media crisis communication for building resilience. Therefore, the section "related work" discusses a few works that study the interaction among various stakeholders involved in crisis response on social media, the existing theories, and the conceptual model. The section "methodology" discusses the data and measurement method. The section "result and findings" presents the result of the content validity index, modified kappa, Cronbach's alpha, and regression model. The section "discussion" presents our argument, and finally, the section "conclusion" presents our concluding remarks and future research.

Related Work

The most dominant and commonly used theory to examine crisis management and communication strategies is the situational crisis communication theory (SCCT) (11; 12). The social-mediated crisis communication (SMCC) model classified social media public as influencers (content creators), followers, and inactive users (13; 14). The integrated crisis mapping (ICM) conceptualizes stakeholders' emotions (15). Reference (16) integrated the SCCT, SMCC, and ICM to link stakeholders' emotions and response strategies. Furthermore, (17) proposed the STREMI model, particularly for social media crisis management, is dynamic and cyclic, but the model is limited to response and recovery (18). Also, a new integrated crisis mapping approach based on ICM provides a general approach and directions for building a crisis communication model and a direct way of handling crisis response for effective reactions of public emotions (19). Moreover, the social media disaster resilience (SMDR) model has demonstrated how social media usage improves community resilience during and after crisis (20). Additionally, reference (21) introduced an interactive crisis communication model (ICCM) based on SCCT, SMCC, and traditional crisis communication strategies (CCS). ICCM is the first model that provides an integrated strategy toolkit that synthesizes SCCT and CCS crisis response strategies. The major weakness of ICCM is its failure to investigate the impact of interaction among stakeholders. The theoretical models and hypotheses are discussed as follows;

Situational Crisis Communication Theory (SCCT)

Situational crisis communication theory (SCCT) was developed in 1995, refined, and renamed in 2002 (11). The SCCT was motivated by the absence of a model to connect crisis to crisis response strategies (what crisis communicators say and do during a crisis) and crisis situations. The SCCT connects crisis and crisis response strategies and crisis types through the lens of attribution theory. Through crisis response, individuals seek to comprehend why a crisis event occurred. The work by (11) highlighted the importance of attributions, stating that they influence how people feel and react to an event. According to SCCT, crises are adverse events that cause people to judge the crisis management authorities, and a timely response safeguards the crisis management reputations (22). The digital environment, mainly social media platforms, enables individuals to challenge crisis management (11) due to public engagement in crisis response via social media, which also aids in the recovery process. On social media, the crisis has an impact on how crisis response is formed and led. Thus, crisis response and social media

interaction are used to address the situation when the crisis occurs. This demonstrated the effectiveness of crisis response and social media interaction in assisting people recovering from a crisis. Thus, the research framework (Figure 2) indicates that crisis significantly affects resilience, social media interaction, and crisis response, as the following hypothesis suggests.

- Hypothesis 1 (H1): Crisis has a significant impact on resilience.
- Hypothesis 2 (H2): Crisis has a significant impact on the crisis response.
- Hypothesis 3 (H3): Crisis has a significant impact on social media interaction.

Additionally, crisis response refers to the response of stakeholders (both public and management) to a crisis. This is discussed in the social-mediated crisis communication model (SMCC), which focuses on the types of public, the sources of information, and the information format. The crisis response enables stakeholders to create content that expresses their views on/about the crisis or the entity managing it. Understanding the full range of public emotions enhances the effectiveness of crisis response strategies (14; 16; 17), all of which have an effect on the public's ability to recover. The crisis management literature frequently refers to three stages of crisis management as para-crisis, crisis, and post-crisis (14; 18; 21; 23). As is the case with crisis responses, the nature of the para-crisis is considered to determine the para-crisis response that will most effectively mitigate the crisis risk (11). Thus, crisis response has an effect on resilience and social media interaction. Hence, the crisis-resilience relationship is mediated by crisis response and social media interaction. Therefore, this study implies that crisis response acts as a mediator between crisis and social interaction, as well as between crisis and resilience, as described in the hypothesis below.

- Hypothesis 4 (H4): Crisis response has a significant impact on resilience.
- Hypothesis 5 (H5): Crisis response has a significant impact on social media interaction.
- Hypothesis 7 (H7): The relationship between crisis and social media interaction is mediated by crisis response.
- Hypothesis 8 (H8): The relationship between crisis and resilience is mediated by crisis response.

Interactive Crisis Communication Model (ICCM)

The interactive crisis communication model (ICCM), introduced by (21), is relatively new in the crisis communication literature, which is based on SCCT, SMCC, and traditional crisis communication strategies (CCS). The ICCM is built for social media, demonstrating and representing the total interaction of stakeholders in a digital environment. Since everyone participates in crisis response, the model reaffirms the SMCC classification of public engagement and interactions. The ICCM demonstrates the importance of social interaction by demonstrating its capacity to provide one of the four gratifications identified in the uses and gratification theory (UGT) (24; 25). The entire ICCM is referred to as an interactive model, as it illustrates the fundamental elements of crisis management's interaction with the public. Similarly, the interaction is a fundamental component of the STREMI model (17). The ICCM demonstrates why social interaction is critical in social media crisis response. According to the ICCM model, since social media is an object or environment that enables groups and individuals to collaborate, the content can take the form of text, visual, audio, or a combination of these, which referred to as the interaction's content (14; 17; 20; 21). The contents are from two sources: crisis management and public response. The purpose of this study is to examine the effect of social interaction on resilience. Thus, this study implies that there is a relationship between social media interaction and resilience. As demonstrated in the hypothesis below, social media interaction serves as a mediator between crisis and resilience and crisis response and resilience.

- Hypothesis 6 (H6): Social media interaction has a significant impact on resilience.
- Hypothesis 9 (H9): The relationship between crisis and resilience is mediated by social media interaction.

- Hypothesis 10 (H10): The relationship between crisis response and resilience is mediated by social media interaction.

Social Media Disaster Resilience (SMDR) Model

The social-mediated disaster resilience (SMDR) model was introduced by (20), who demonstrated how social media usage is integrated into resilience building and discusses its potential for increasing hotel resilience. The study links resilience and disaster management literature using the revised 3Rs (robustness, rapidity, and redundancy) resilience model. Then, discussed social media as a robust technology to be used in crisis(13), to increase the speed of communication and information distribution (rapidity) (26; 27), and to redistribute the targeted information to a larger crowd via crowdsourcing (redundancy). In general, there is enough literature on how social media detects and document disasters (28), send and receive assistance (29), spread warnings (30), and solicit donations and volunteerism (29; 30). Thus, the robustness of social media has enabled the public to participate in crisis communication discussions, establishing them as vital resources (31). Additionally, the information can be quickly and widely distributed via social media crisis response and social interaction. While resistance is the first ideal outcome following a crisis, robustness, rapidity, and redundancy (3Rs) are critical for increasing resilience to the adverse effects of a crisis or disaster (20). Hence, it is essential to investigate the impact of crisis management efforts since their role is to strengthen relationships and improves the community's resilience (14; 20). Accordingly, crisis response and social media interaction mediates the crisis-resilience relationship as the following hypothesis suggest.

- Hypothesis 11 (H11): The relationship between crisis and resilience is mediated by crisis response and social media interaction.

Conceptual Model

According to reference (12), in the effort to represent the nature of the interactions between various stakeholders and how this study concept is different from existing studies of crisis communication. The study reiterates this concept and introduces the ICCM model representing the interaction between crisis management and the public on the social media environment (21) as reported in the STREMI model (17). Then adopted the resilience concept from the SMDR model that shows how social media usage improves community resilience (20).

First, since the crisis is the trigger that allows crisis response (32) to take place on social media, the nature of the crisis and crisis response are factors influencing stakeholder's formation on social media. These reflect the unmet challenge of integrating qualitative and quantitative modeling to understand how interaction, leadership, and social structure are represented in electronic trace data generated due to crisis and stakeholder's crisis responses (33). Second, the online contexts in which stakeholders interact as sociotechnical interaction places as represented in ICCM (21). This indicates where peoples interact as groups for a specific purpose and mediate consistent and meaningful aspects of their activity through technology that generates electronic trace data. The entire ICCM represents social interaction between stakeholders involves in crisis responses. Third, the SMDR proved the use of social media for building resilience but does not investigate the impact of social media usage or interaction through quantitative means. Therefore, the conceptual model (presented in Figure 2 along with the result) intends to show how social media interactions can improve community resilience since crisis management actions aim to improve the relationship and increase community resilience. The interactions between stakeholders (management and public) due to crisis can show the intensity of crisis response on social media(14; 20).

Methods

Data and Measures

The questionnaire's items are derived from existing literature (20; 25). The expert evaluation was developed based on these items, including discussing each construct, item, and how the existing theories were linked to form the relationship between the variables. Then, the evaluation document was sent to the expert for content and face validity. There are several recommendations for performing content validity (25; 34; 35). In this study, the validation uses three experts in crisis informatics and crisis communication, which have over 50 years of combined working experience.

The expert evaluation form consists of 34 items distributed among the four constructs; crisis = 6, crisis response = 6, social media interaction = 7, and resilience = 15. For content validation, several studies are encouraging using a 4-point Likert scale to avoid aggregation problems (34; 35). Therefore, each item was measured using 4-point Likert scales ranging from 1 (not relevant) to 4 (highly relevant) for the expert evaluation phase to examine if the items are appropriate to measure what it intends to measure. Notably, the expert encouraged the use of a 5-point Likert for further study. After passing the early validation phase, the questionnaire was designed via an online platform (Google Form) on 5-point Likert scales with a range from 1 (strongly agree) to 5 (strongly disagree). The answers were received within one week, with 32 completed responses. Study participants must have experienced Covid-19 lockdown and have observed social distancing rules to avoid the crowded area, self-isolate, or quarantine. The respondents were mainly males (approximately 85%) and are highly educated; 94% held a postgraduate or master's degree. In terms of age, most respondents were in the age range of 35–44 (51.5%) or 25–34 (33.3%). Approximately 12.1% were between 45 and above years old, and about 3.1% were between 18 - 24 years old. The sample was considered appropriate for the preliminary test (pilot study) of the study.

Method of Analysis

The analysis methods are considered threefold; the content validity method, the reliability, and the assessment model fit, and the mediation fit model. Therefore, the content validity index (CVI) is considered the most widely used method to validate research items (34; 36). The CVI expressed and classified the proportion of agreement into either 0 or 1. Although the significant weakness of CVI is its failure to adjust for chance agreement and the researchers suggest the modified kappa statistics to address chance agreement (34; 35; 37). Studies encouraging the use of a 4-point Likert scale for CVI specified that the rating of 1 and 2 are considered content invalid while those from 3 and 4 to be content valid (34; 35; 36; 37). Therefore, the 4-point rating is collapsed into dichotomous categories of responses. Any response that falls between 1 and 2 is assigned 0, and those that fall in 3 and 4 are assigned 1. Secondly, the instrument's reliability and the relationship between the independent variables (IVs) and the dependent variable (DV) were measured using Cronbach's alpha and regression model. Thirdly, the hypotheses were independently assessed in PROCESS macro models (38), and the indirect effect was tested using a percentile bootstrap estimation approach with 5000 samples (39) on SPSS version 24.

Result and Findings

Content Validation

Several studies have provided information on how to sufficiently measure the value that indicates a high level of agreement among the raters (34; 35; 37; 36). (34) emphasized that an average value of 70% is necessary for agreement, 80% for adequate agreement, and 90% for a good agreement. In comparison, other researchers recommend values between 70 and 79 percent to be considered for revision while less than 70% to be eliminated (35; 37). Also, few

suggestions are also employed to measure the strength of agreement for kappa which classified as less than 0.40 as poor, 0.40 – 0.59 as fair, 0.60 - 0.74 as good, and 0.75 – 1.00 as excellent (34; 37). The result of CVI and modified kappa statistics are excellent for this study. All the items indicate an excellent level of agreement among the expert. The value for I-CVI and Modified kappa for each item is 1.

Reliability and Consistency of the Instrument

The Cronbach's alpha assessed scale reliability, and the alpha for each construct is presented in Table 1.

Table 1. Cronbach Alpha Reliability Parameters of the Constructs

Constructs	No of items	Cronbach Alpha
Crisis	6	0.743
Crisis response	6-1 (5)	0.724
Social media interaction	7	0.716
Resilience	15	0.827

Model Analysis

Multiple regression was applied to predict resilience from the crisis, crisis response, and social media interaction. These variables statistically significantly predicted resilience, $F(3, 95) = 15.141$, $p < 0.05$, $R^2 = 0.619$. The standard error of the estimate determines how the model fits the data. A rule of thumb R-value is considered a measure of predicting the DV; in this case, resilience. A value of 0.787 indicates a good level of model fits. Also, the R Square value, which is 0.619, shows that the IVs explain 61.9% of the variability of the DV.

In Table 2, the overall model is tested to determine if the regression model is a good fit for the data. The result of the analysis of variance (ANOVA) indicates that the IVs statistically significantly predicts the DV, $p < 0.05$. The results indicated that the overall model is a good fit for the data.

Table 2. Analysis of Variance (ANOVA)

Model 1	Sum of Squares	Df	Mean Square	F	Sig.
Regression	3.056	3	1.019	15.141	.000 ^b
Residual	1.884	28	0.067		
s Total	4.94	31			

a. Dependent Variable: Resilience

b. Predictors: (Constant), Interaction, CrisisResponse, Crisis

Figure 1 presents the results for multivariate normality and linear relationship between the IVs and the DV. The results in Figure 1 (left) indicate that the multivariate normality is present in the data, normally distributed. Secondly, in Figure 1 (right), the results suggested an excellent linear relationship between the IVs and the DV.

Path and Mediation Analysis

Results are obtained concerning the relationship between the IVs and the DV and whether social media interaction acted as a mediator between crisis and resilience and between crisis response and resilience. Additionally, results are obtained for whether crisis response acted as a mediator between crisis and resilience. Figure 2 presents the impact of the crisis, crisis response, and social media interaction on resilience.

The results indicated that crisis is a significant predictor of resilience, $\beta = 0.3155$, $SE = 0.1318$, $p < 0.05$, crisis response, $\beta = 0.5480$, $SE = 0.1795$, $p < 0.05$, and social media interaction, $\beta = 0.6636$, $SE = 0.1413$, $p < 0.05$, indicating support for H1, H2, and H3. Similarly,

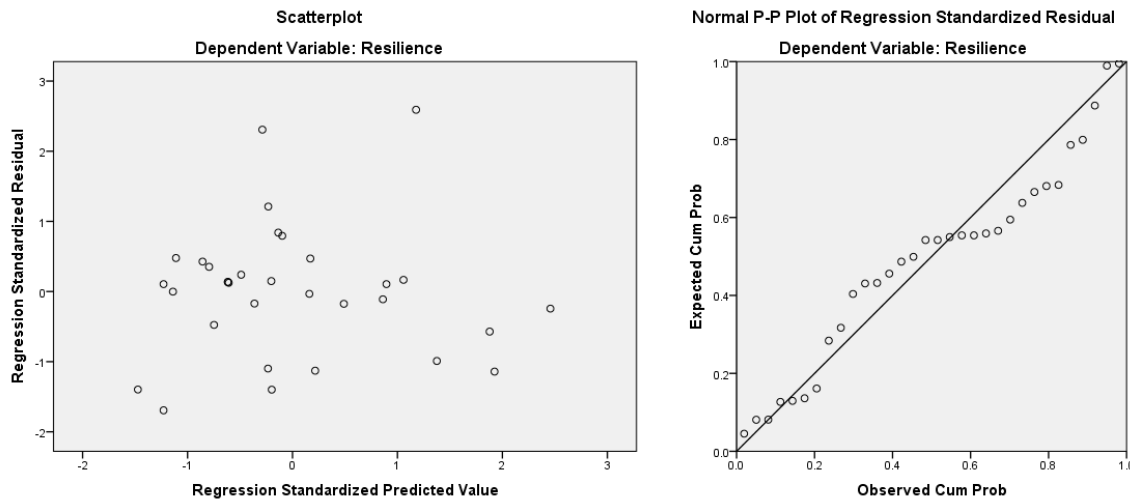


Figure 1. Result for Multivariate Normality of IV and DV (left) and Relationship Between IV and DV (right)

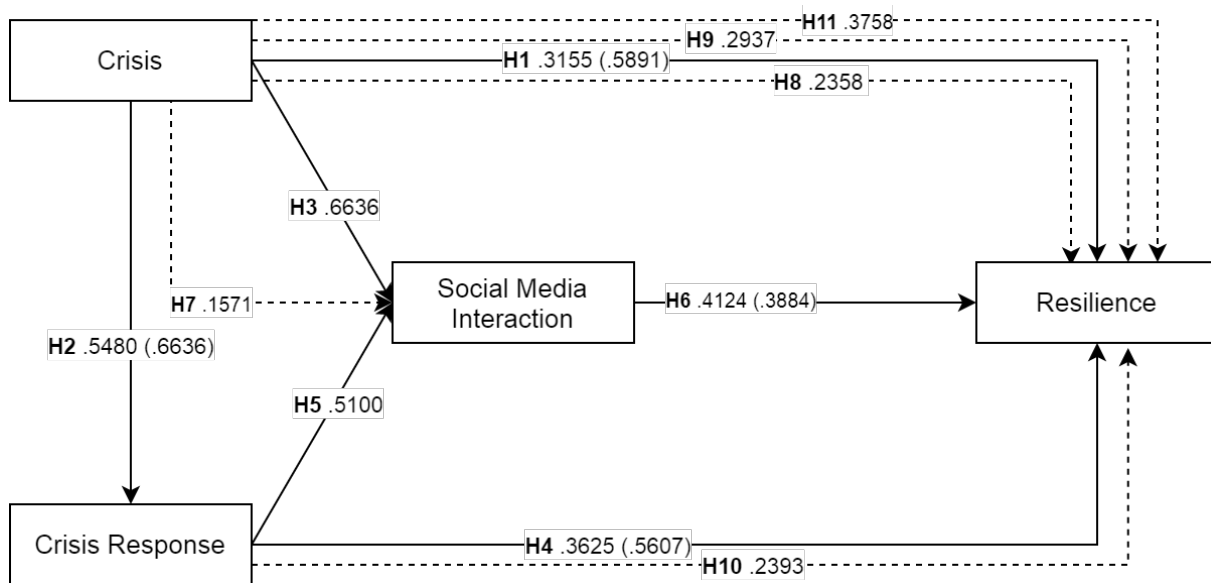


Figure 2. A Model for Social Media Crisis Communication for Resilience

the results indicated that crisis response is a significant predictor of resilience, $\beta = 0.3625$, SE = 0.1112, $p < 0.05$ and social media interaction, $\beta = 0.5100$, SE = 0.1367, $p < 0.05$, indicating support for H4 and H5. Also, social media interaction is a significant predictor of resilience, $\beta = 0.4124$, SE = 0.1553, $p < 0.05$, indicating support for H6.

The results of mediation was observed. The results for the indirect effect of social media interaction on crisis-crisis response relationship indicated that the indirect coefficient was significant, $\beta = 0.1571$, SE = 0.0969, 95% CI = 0.0145, 0.3898, indicating support for H7. The proportion of the total effect of crisis on crisis response is $\beta = 0.6636$, SE = 0.1413, $p < 0.05$, $R^2 = 0.4237$, is indirectly significant by 42.37%. Moreover, the results for the indirect effect of crisis response on crisis-resilience relationship indicated that the indirect coefficient was significant, $\beta = 0.2358$, SE = 0.0958, 95% CI = 0.0625, 0.4465, indicating support for H8. The proportion of the total effect of crisis on resilience is $\beta = 0.5891$, SE = 0.1318, $p < 0.05$, $R^2 = 0.3998$, is indirectly significant by 39.98%. Moreover, the results for the indirect effect of social media interaction on crisis-resilience relationship indicated that the indirect coefficient was significant, $\beta = 0.2937$, SE = 0.1598, 95% CI = 0.0834, 0.7250, indicating support for H9. The proportion

of the total effect of crisis on resilience is $\beta = 0.5891$, $SE = 0.1318$, $p < 0.05$, $R^2 = 0.3998$, is indirectly significant by 39.98%. Additionally, the results for the indirect effect of social media interaction on crisis response-resilience relationship indicated that the indirect coefficient was significant, $\beta = 0.2393$, $SE = 0.1152$, 95% CI = 0.0576, 0.5003, indicating support H10. The proportion of the total effect of crisis response on resilience is $\beta = 0.5607$, $SE = 0.1112$, $p < 0.05$, $R^2 = 0.4587$, is indirectly significant by 45.87%. Finally, the results for the indirect effect of social media interaction and crisis response on crisis-resilience relationship indicated that the indirect coefficient was significant, $\beta = 0.3758$, $SE = 0.1385$, 95% CI = 0.1499, 0.7269, indicating support for H11. The proportion of the total effect of crisis on resilience is $\beta = 0.5891$, $SE = 0.1318$, $p < 0.05$, $R^2 = 0.3993$, is indirectly significant by 39.93%.

Result Summary

The expert validation results show that all items indicate excellent agreement both from CVI and modified kappa statistics. The scale reliability and internal consistency were measures using Cronbach's alpha, and the results observed that one of the items has less scored by the participants. This item was not considered in the linear regression model and process macro model, which is left for further study with a large sample size. Furthermore, the mediation analysis based on the regression coefficients supported all the hypotheses, see Table 3.

Table 3. Hypothesis Assessment of the Direct and Indirect Effects

S/N	Hypotheses	Decision
H1	Crisis – > Resilience	Supported
H2	Crisis – > Crisis response	Supported
H3	Crisis – > Social media interaction	Supported
H4	Crisis response – > Resilience	Supported
H5	Crisis response – > Social media interaction	Supported
H6	Social media interaction – > Resilience	Supported
H7	Crisis – > Crisis response – > Social media interaction	Supported
H8	Crisis – > Crisis response – > Resilience	Supported
H9	Crisis – > Social media interaction – > Resilience	Supported
H10	Crisis response – > Social media interaction – > Resilience	Supported
H11	Crisis – > Crisis response – > Social media interaction – > Resilience	Supported

Discussion

The discussion about the potentials of social media to improve stakeholders' relationships and increase community resilience called for empirical investigation of this research. As the central aspect of this work, the study conducted a preliminary investigation for social media crisis communication and resilience that offer the basics to determine effective social media-based crisis communication and management. Thus, a particular discussion is about the results and findings achieved from the evaluation of the pilot study. According to the findings, all the research hypotheses were supported. The findings indicated that the public ability to recover from a crisis could be improved through social media-based crisis communication by meaningful engagement in crisis response and social interaction on social media.

Firstly, the findings of this study support existing works (21; 20; 17), whose conceptualizations of a social media-based crisis communication model emphasized the critical nature of crisis response and social interaction via social media use. These studies laid the groundwork for the model proposed in this paper. However, a few studies have examined the various stakeholders involved in crisis communication on social media (40; 41; 42) with focused on actors in the issue arena, knowledge about stakeholders relationships, and content of crisis communication. Reasonably, this study may serve as evidence that the goal of crisis informatics is to comprehend the interaction of stakeholders involved in crisis communication (43). Thus, this

study contributes to the advancement of social media use for crisis communication.

Secondly, reference (44) stated that the long-term impact of the Covid-19 pandemic is unknown, but it is undoubtedly going to last longer than anticipated. One of the pandemic's most significant and immediate effects is how it has shattered the public relationship. Restriction of movement creates a stressful awareness that one's well-being is dependent on others. The pandemic severely harmed individuals' capacity to have actual close relationships with other people, severely harmed the extreme human need for contact, and discouraging any other physical affection and connection. Whereas the explosion of electronic-mediated interaction in recent decades, most notably via social media, has aided people in recovering from crises, demonstrating how critical in-person interaction via social media is building public resilience during the pandemic.

Thirdly, individuals were unable to participate in social activities during the pandemic period. Thus, this study responds to a call for additional research into the short and long-term consequences of critical life-course changes. The crisis and physical separation have the potential to have both immediate and long-term effects on relationships. Some people are susceptible to changes in their environment, especially children. When isolation began, there was considerable anxiety about the infection entering and spreading through the families, and household members struggled to express affection securely physically. Interestingly, social media activities (crisis response and social interaction) have aided significantly in effectively managing physical distancing in these circumstances. Thus, the proposed model demonstrates the future direction of crisis communication to assist affected citizens during such times.

Additionally, when schools are closed, children and adolescents cannot interact face-to-face with their friends. Peer gatherings and fellowships are critical for teenagers' character and identity exploration. Social media enabled friendships to endure and engagement to occur. Similarly, despite the availability of various platforms to mitigate the impact of restricted human movement, there were still concerns about the public's emotions, needs for fulfillment, and relationship survival. As a result, the model validated in this study established the requirements and framework for providing effective crisis communication to address these concerns. Finally, the pandemic displaced many people from their jobs, forcing them to collaborate and maintain associations remotely and distantly. Surprisingly, the relationships between the variables examined in this study may aid crisis management organizations in re-positioning their crisis communication activities more effectively.

Conclusion

This study reported the preliminary test of the impact of the crisis, crisis response, and social media interaction on resilience building. CVI was used for content validation, while Cronbach alpha and regression analysis was incorporated to check the reliability, model fits, and mediation fits. The findings show that the content validity shows excellent agreement among the raters. The internal consistency of each variable meets the required minimum for acceptance, and the regression model is significant.

This study is not without limitations, and the major one is that the test sample is very homogeneous. The respondents were mainly male and mainly from a particular age group. This makes it hard to generalize the finding to women or other age groups, who are also affected by crises. In the future, we intend to collect data from large sample size to investigate the impact of the crisis, crisis response, and social media interaction. Also since the model suggested some attributes of social media interaction such as time distance, type (mode), content, frequency, duration, and intensity. Further work could collect the content of crisis responses from social networking sites based on these attributes. The content can be analyzed using sentiment analysis to understand the intensity of the interaction among stakeholders.

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