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A Model for Enhancing Social Media Crisis Communication for Resilience Building: A Preliminary Analysis

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***Abstract*—What matters to people during a crisis is returning to their normal lives quickly and effectively. As a result, there has been a significant increase in interest in crisis recovery and resilience, particularly regarding the effects of crises and the role of social media in informing stakeholders. Prior studies assessing public resilience predictors and the impact of social media activities on resilience are lacking in identifying the factors that influence people's ability to recover from a crisis through social media crisis communication. Thus, the purpose of this study is to conduct a preliminary analysis to determine the impact of social media usage, information seeking, and information sharing on public resilience. A total of 107 items were developed based on the literature covering the following topics: Information Seeking (media choice, crisis type, uncertainty avoidance, framing, trust, efficacy, and perceived risk), Information Sharing (sentiment, richness, and authority), Social Media Usage (media exposure and uncertainty), and Resilience. Four experts validated these items using adjusted Kappa statistics and the content validity index. Subsequently, 30 responses were used in a pilot test to assess the reliability of the instruments, after 94 items passed expert validation. To evaluate the reliability of the items, Cronbach's alpha was employed. The results show that all the items were reliable, with Cronbach's alpha values ranging from 0.748 to 0.861. Therefore, the constructs satisfied the internal consistency requirement based on the obtained results. Overall, the study provides foundation for both theoretical advancements and practical applications in the domain of social media crisis communication.**

***Keywords*—Social media; resilience building; crisis communication; communication model.**

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I. Introduction

The terms crisis, disaster, and emergency management are commonly used interchangeably [1]–[3]. In a highly dynamic and uncertain environment, the task of managing crises or disasters involves planning effective operations for information distribution, security, and supply management [4]. While it is difficult to foresee when a crisis or disaster will recur [5], enabling technology can lessen their effects by preventing, reducing or mitigating the impact of a crisis [6]. Social media has emerged as a crucial channel for communication in the connected world of today, especially in times of crisis [1], [7]–[9]. The social media ability to communicate with large audiences flawlessly in an incredibly short amount of time combined with its broad reach makes it a priceless instrument for sharing public opinion, mobilizing resources, and distributing information. This offers valuable opportunities for disaster relief efforts that can be planned using data collected from these platforms [10], [11]. However, the methods used to negotiate the intricate dynamics of online relationships determine how useful social media is in crisis communication.

In crisis management, the importance of information cannot be emphasized [12], [13]. The timely, accurate, and high-quality information that stakeholders have access to is critical for efficient decision-making, quick responses, and resource allocation. A crucial first stage in the crisis management process is frequently information searching, the proactive act of looking for pertinent data and insights during a crisis [14]–[16]. Concurrently, coordinated and cooperative reactions depend heavily on information sharing—the process of getting important information out to the appropriate people. During emergencies, social media platforms have added additional dimensions to information sharing and searching

due to their real-time communication capabilities. As a result of these platforms, information can be shared quickly and effectively, giving people and organizations new opportunities for connection, communication, and mobilization [17]–[20].

Therefore, as part of the ongoing research aimed at developing a model to identify essential elements and best practices that can maximize the use of social media during crises and strengthen the resilience of communities and organizations, this study set out to explore and improve the Social Media Crisis Communication and Resilience (SMCCR) model. The study is organized as follows: Section I includes the introduction and the existing studies that examine how various integrated theoretical models have been used to enhance crisis response and recovery in the digital age. These studies include existing theories and factors influencing crisis response and resilience on social media. Section II covers the data and measuring instruments. The results of the regression model, Cronbach's alpha, modified kappa, and content validity index are presented in Section III. The argument and implications of the study are also discussed in the section. Finally, Section IV presents the concluding remarks and suggestions for further research.

The extant literature on social media crisis utilization and information sharing presents a rich tapestry of research endeavors, each shedding light on the intricacies of this complex phenomenon. Jacobs et al. [21] investigate how individuals leverage the internet through the digital media to acquire information during medical emergencies. Reuter and Spielhofer [17] delved into perception of social media to understand opportunities and challenges across platforms such as Facebook, Twitter, Instagram, and YouTube during crises. In addition, by adopting theories like theory of planned behavior (TPB) and use and gratification theory (UGT), Chen et al. [22] explored information-seeking, entertainment, and status-seeking behaviors on WeChat.

Furthermore, Lee and Jin [16] focused on health emergencies, applying the crisis information seeking and sharing (CISS) instrument to examine information-seeking and sharing on platforms like Twitter, Instagram, Pinterest, and Snapchat. Reuter et al. [23] investigated perceptions of Facebook, Twitter, and Instagram during times of crisis, leveraging surveys and statistical tests. Moreover, Li et al. [24] investigated the motivations behind social media use on WeChat, considering behaviors like sharing, communication, and information-seeking, and drawing upon theories such as UGT, task-technology fit (TTF) model, and media dependency theory (MDT).

Additionally, Oh et al. [25] investigated risk information exposure and preventative behavior during MERS outbreaks, leveraging the appraisal tendency framework (ATF) across various platforms. Bukar et al. [26], [27] proposes the social media crisis communication and resilience (SMCCR) model to examine resilience during the COVID-19 pandemic, exploring crisis response and social media interactions across multiple platforms. Malik et al. [28] examined Facebook users' information-sharing habits during COVID-19, considering aspects like entertainment and status-seeking, while drawing on TPB and UGT. Wu and Kuang [29] explored information-sharing on WeChat during medical situations, considering social support and status-seeking, in addition to theories like TPB, UGT, and social cognitive theory (SCT). Additionally, Wang et al. [30] centered their investigation on crisis communication habits in a broader environment, considering risk culture and stringent censoring in the context of COVID-19. Furthermore, Bukar et al. [14] extended the SMCCR with information seeking and sharing from CISS constructs to investigate factors influencing resilience in flooding emergencies. The SMCCR was further extended and evaluated using an analytical hierarchy process with expert participants to rank several factors of information seeking, sharing, and social media usage [31].

TABLE I
CRITICAL ANALYSIS OF EXISTING LITERATURE

Ref	TPB	UGT	CISS	TTF	MDT	SMCCR	SCT	ATF
[22]	✓	✓						
[16]			✓					
[24]		✓		✓	✓			
[27]						✓		
[28]	✓	✓						
[25]								✓
[29]	✓	✓					✓	
[14]			✓			✓		
[31]			✓			✓		

Collectively, these works offer a comprehensive perspective on the intricate aspects of social media behavior during crises, drawing upon diverse theories, approaches, social media platforms, and crisis situations. This body of research significantly advances our understanding of this complex and multifaceted topic. Existing studies integrated various theories to capture the landscape of social media crisis communication and factors influencing its usage [14], [22], [28], [29]. However, the integration of CISS and SMCCR as well as ATF [14], [16], [27], [29] is still early and therefore a comprehensive model is lacking to represent various dimensions of social media usage, information seeking, and information sharing. Hence, the study validates the development of a comprehensive framework for analyzing public resilience in the context of social media. This study aims to conduct a preliminary test of the prioritized factors identified [31], which are conceptually outlined here, to inform future theoretical investigations and improvements in the field of social media crisis communication and its impact on building resilience. Consequently, the study concentrates on evaluating how social media usage, information seeking, and information sharing influence public resilience in times of crisis.

II. Materials and Method

A. Data and Measures

The items for the key factors (information seeking, information sharing, and social media usage) in the questionnaire were drawn from the existing literature [14], [16]. The researchers developed the dimensions and their corresponding items. An expert evaluation form was created, which included a discussion of each construct, item, and the proposed relationship between the variables. This form was then provided to the experts to ensure its face validity and content validity. Establishing content validity is particularly important when developing or enhancing theory [26], [32]–[34]. The current study utilized four experts with over 50 years of combined experience in various fields.

Thus, the background of these respondents, each holding Ph.D. degrees and combining academic and industry experience, offers a robust foundation for instrument validation. Their diverse professional backgrounds span cutting-edge fields such as computation, image processing, and engineering. This extensive expertise enables them to critically evaluate research instruments, understanding both theoretical and practical applications. Their academic credentials are complemented by significant industry experience, allowing them to assess the instruments' reliability and validity from multiple perspectives. This combination of academic rigor and practical insight ensures a thorough and well-rounded approach to validating research tools, enhancing their applicability and effectiveness in various real-world contexts.

The expert evaluation form consisted of 107 items, which were categorized according to the constructs: information seeking (5 items), media choice (6 items), crisis type (6 items), uncertainty avoidance (6 items), framing (6 items), trust (5 items), efficacy (6 items), perceived risk (6 items), information sharing (5 items), sentiment (5 items), richness (7 items), authority (6 items), social media usage (4 items), media exposure (6 items), uncertainty (5 items), and resilience (15 items). A 4-point Likert scale was recommended for the content evaluation to prevent aggregation issues [26], [32], [33]. Each item was assessed using a 4-point Likert scale, where 1 indicated "not relevant" and 4 indicated "highly relevant." In contrast, a 5-point Likert scale was utilized during the pilot test.

The questionnaire was developed using an online platform (Google Forms) and a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Thirty responses were analyzed, and the participants reported having experience with civil unrest and looting, earthquakes, and the COVID-19 lockdown. Almost all respondents were male, with 58% possessing a master's or postgraduate degree, indicating a high level of educational attainment. Most of the respondents were between the ages of 19-30 (32.7%) and 31-40 (25.8%), while 22.1% were 41-50 years old and 19.35% were 51 and above. The sample was deemed suitable for the project's pilot study, which served as its preliminary analysis.

A. Method of Analysis

The analysis of the data involved three key methods: content validity assessment, pilot testing for reliability analysis, and regression analysis to evaluate model fit. Firstly, the content validity index (CVI) was employed as the predominant approach for confirming the study's constructs [32], [35]. The CVI provides a quantitative measure of the agreement among the experts, classifying the percentage of agreement as either 0 or 1. To address the primary limitation of the CVI, which is its inability to account for chance agreement, the researchers utilized the updated kappa statistics [32]–[34]. In the analysis, ratings of 1 and 2 were considered content-invalid, while ratings of 3 and 4 were deemed content-valid. The 4-point rating scale was then converted into binary response categories, with 0 assigned to responses between 1 and 2, and 1 assigned to responses between 3 and 4. Second, the reliability of the instrument was evaluated using Cronbach's alpha, a widely accepted measure of internal consistency. Thirdly, the relationship between the independent variables (IVs) and the dependent variable (DV) was examined using regression analysis. This statistical technique allowed the researchers to model and assess the strength of the associations between the variables. By employing these three complementary analytical methods - content validity assessment, reliability analysis, and regression modeling - the researchers were able to comprehensively evaluate the validity, reliability, and predictive power of the study's constructs and measures.

III. Results and Discussion

A. Content Validation

Previous studies have provided guidance on interpreting the levels of agreement among raters [32]–[35]. Specifically, an average value of 70% is considered the minimum threshold for agreement, 80% denotes adequate agreement, and 90% reflects excellent agreement. Researchers have recommended discarding values less than 70% and considering revisions for those between 70 and 79 percent [33], [34]. Regarding the interpretation of kappa statistics, values less than 0.40 are considered poor, 0.40 to 0.59 are fair, 0.60 to 0.74 are good, and 0.75 to 1.00 are considered exceptional [32], [34].

In the current study, the modified kappa statistics and CVI results indicate an acceptable level of agreement among the expert raters. Each individual item under scrutiny demonstrated a consensus among the experts involved. Specifically, the modified kappa values ranged from 0.666 to 1.0, signaling good to exceptional agreement. Furthermore, the I-CVI values were 1.0, indicating absolute agreement, and 0.75, suggesting the need for revisions according to the CVI guidelines. However, given the limitations of the CVI, the modified kappa results were considered as the primary indicator of content validity in this study.

B. Reliability and Consistency of the Instrument

The reliability of the scale across various constructs was assessed using Cronbach's alpha analysis. The results are presented in Table III, which includes Cronbach's alpha values for each construct alongside the corresponding number of items. The findings reveal a strong internal consistency within the constructs, with Cronbach's alpha coefficients ranging from 0.748 to 0.952. Notably, the constructs of perceived risk, efficacy, and media exposure exhibit particularly high levels of reliability, with Cronbach's alpha values exceeding 0.90. Additionally, the constructs of crisis type, framing, richness, authority, and resilience also demonstrate substantial reliability, with alpha values ranging from 0.840 to 0.929.

The average Cronbach's alpha coefficient across all constructs is 0.841, indicating a consistently high level of reliability throughout the scale. These results suggest that the scale reliably measures the intended constructs, thereby enhancing the credibility and validity of the study's findings. The robust internal consistency observed across the various constructs provides confidence in the reliability of the measurement instrument used in this study. This, in turn, supports the overall significance of the research conclusions drawn from the data. These findings validate the rigor of the assessment process and highlight the robust reliability and validity of the data obtained, as shown in Table II.

TABLE II
THE SUMMARY OF THE CONTENT VALIDITY

Construct	Expert1	Expert2	Expert3	Expert4	Total Expert	Agreement	I-CVI	UA	S-CVI/Ave	S-CVI/UA	Pc	M-Kappa (mK)
ISE	1	1	1	1	4	4	1	4	0.716667	3.2	0.0625	1
MC	1	1	1	1	4	4	1	4			0.0625	1
CT	1	1	0	1	4	3	0.75	4			0.25	0.666667
UA	1	1	1	0	4	3	0.75	4			0.25	0.666667
FR	1	1	1	1	4	4	1	4			0.0625	1
TR	1	1	1	1	4	4	1	4			0.0625	1
EF	1	1	1	1	4	4	1	4			0.0625	1
PR	1	0	1	1	4	3	0.75	4			0.25	0.666667
ISH	1	1	1	1	4	4	1	4			0.0625	1
SE	1	1	1	0	4	3	0.75	4			0.25	0.666667
RI	1	1	0	1	4	3	0.75	4			0.25	0.666667
AU	1	1	1	1	4	4	1	4			0.0625	1
SMU	1	1	1	1	4	4	1	4			0.0625	1
ME	1	1	1	0	4	3	0.75	4			0.25	0.666667
UN	1	1	0	1	4	3	0.75	4			0.25	0.666667

Abbreviation: Information seeking (ISE), Media Choice (MC), Crisis type (CT), Uncertainty avoidance (UA), Framing (FR), Trust (TR), Efficacy (EF), Perceived risk (PR), Information Sharing (ISH), Sentiment (SE), Richness (RI), Authority (AU), Social media usage (SMU), Media exposure (ME), and Uncertainty (UN).

TABLE III
THE SUMMARY OF THE CONTENT VALIDITY

Construct	No of Items	Cronbach's Alpha
Information seeking	5	0.798
Media choice	6	0.748
Crisis type	6	0.861
Uncertainty avoidance	6	0.758
Framing	6	0.840
Trust	5	0.787
Efficacy	6	0.909
Perceived risk	6	0.929
Information sharing	5	0.786
Sentiment	5	0.752
Richness	7	0.888
Authority	6	0.894
Social media usage	4	0.841
Media exposure	6	0.952
Uncertainty	5	0.833
Resilience	10	0.882
Total Items/A	**94**	
Average Cronbach's Alpha		**0.841**

C. Model Analysis

Multiple regression analysis was employed to examine the predictive relationships between a set of independent variables and the dependent variable of resilience. The independent variables included information seeking, media choice, crisis type, uncertainty avoidance, framing, trust, efficacy, perceived risk, information sharing, sentiment, richness, authority, social media usage, media exposure, and uncertainty. The regression model demonstrated a strong predictive capacity, with the independent variables collectively explaining 85.2% of the variability in the dependent variable of resilience ($R^2 = 0.852$, $F = 5.754$, $p < 0.05$). This indicates a high level of model fit, suggesting that the selected predictors are well-suited for explaining the observed outcomes related to resilience. To ascertain whether the regression model is a good fit for the data, Table IV presents an analysis of the entire model.

The analysis of variance (ANOVA) results further corroborates the statistical significance of the regression model, with the independent variables collectively predicting the dependent variable at a p-value less than 0.05. This finding confirms that the model provides a good fit for the data. Additionally, the diagnostic analyses presented in Fig. 1 and Fig. 2 lend support to the underlying assumptions of the regression model. The results on the left indicate that the data exhibits multivariate normality, a key prerequisite for the valid application of regression techniques. Moreover, the scatterplot on the right demonstrates a robust linear relationship between the independent variables and the dependent variable of resilience.

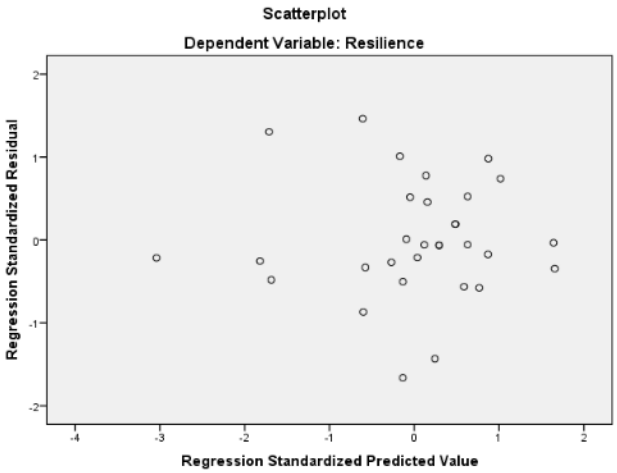

Fig 1 Result for Multivariate Normality of IV and DV

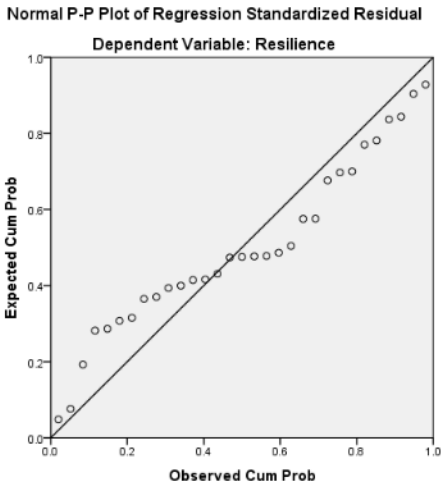

Fig 2 Relationship Between IV and DV

In summary, the multiple regression analysis conducted in this study provides robust evidence that the selected independent variables are effective predictors of resilience. The high R-square value, the statistical significance of the overall model, and the adherence to necessary assumptions collectively support the credibility and reliability of the research findings.

TABLE IV
ANALYSIS OF VARIANCE (ANOVA) AND R-SQUARE

Model	Sum of Squares	Df	Mean Square	F	R^2	Sig.
Regression	10.255	15	.684	5.754	0.852	.001[b]
Residual	1.782	15	.119			
Total	12.037	30				

Note: Dependent Variable: Resilience; Predictors: (Constant) Crisis Information seeking, Media choice, Crisis type, Uncertainty avoidance, Framing, Trust, Efficacy, Perceived risk, Information sharing, Sentiment, Richness, Authority, Social media usage, Media exposure, Uncertainty.

This study undertook a comprehensive examination of information behavior and media usage during crises, utilizing methods to validate the constructs, assess reliability, and analyze predictive models. In this section, the discussion of the aspect of the study's findings to elucidate their significance and implications. Firstly, the study adhered to established guidelines for content validation, drawing on previous literature to define thresholds for agreement among raters. The modified kappa statistics and CVI results reflected an acceptable level of agreement among experts, with Modified Kappa values ranging from 0.666 to 1 and I-CVI values at 1 for absolute agreement and 0.75 signaling the need for revisions. While recognizing the limitations of CVI, the study prioritized modified kappa results, affirming the robustness and validity of the assessment process. These findings underscore the reliability of the data obtained, enhancing the credibility of the study's outcomes.

Secondly, Cronbach's alpha analysis was employed to assess the reliability of the scale across various constructs. The results demonstrated strong internal consistency within the constructs, with Cronbach's alpha coefficients ranging from 0.748 to 0.952. Notably, constructs such as perceived risk, efficacy, and media exposure exhibited particularly high levels of reliability, indicating consistent measurement of intended concepts. Additionally, the average Cronbach's alpha coefficient across all constructs was 0.841, signifying a consistently high level of reliability across the entire scale. These findings validate the reliability of the measurement tool and underscore its effectiveness in capturing the multifaceted nature of information behavior and media usage during crises.

Thirdly, multiple regression analysis was conducted to explore the predictive relationship between various constructs and resilience. The results revealed that information seeking, media choice, crisis type, uncertainty avoidance, framing, trust, efficacy, perceived risk, information sharing, sentiment, richness, authority, social media usage, media exposure, and uncertainty significantly predicted resilience. The high R Square value of 0.852 indicates that the independent variables explain 85.2% of the variability in resilience, suggesting a robust predictive model. The analysis of variance further confirmed the statistical significance of the predictors, underscoring the model's ability to accurately predict resilience. Moreover, the results for multivariate normality and linear relationship between the independent variables and the dependent variable indicated a satisfactory fit for the regression model, further validating its effectiveness in explaining resilience during crises. Overall, the study's findings provide valuable insights into the complexities of information behavior and media usage in crisis contexts. By employing rigorous validation techniques and robust statistical analyses, the study enhances our understanding of the factors influencing resilience and informs the development of effective crisis communication strategies and interventions.

In addition, the findings of this study have both theoretical and practical implications for the field of social media crisis communication. Theoretically, the study contributes to the theoretical understanding of how social media usage, information seeking, and information sharing influence public resilience during crises. The examination of these factors refines existing models of crisis communication and resilience, integrating new dimensions like media choice, sentiment, and perceived risk. In addition, the validation of 107 items related to information seeking, information sharing, social media usage, and resilience advances theoretical models by providing empirical evidence of the reliability and validity of these constructs. This helps to solidify the theoretical foundations for future research and theory development in crisis communication.

Practically, the findings of this study offer actionable insights for practitioners in crisis management and communication. Understanding the role of social media in resilience can help organizations tailor their communication strategies to enhance public resilience, ensuring timely and effective information dissemination. Moreover, insights from the study can inform how organizations and stakeholders utilize various social media platforms to engage with the public during crises. By focusing on media choice, sentiment, and information sharing, practitioners can better address public concerns and foster resilience.

IV. Conclusion

This study investigated the impact of several factors, including crisis information seeking, media choice, crisis type, uncertainty avoidance, framing, trust, efficacy, perceived risk, information sharing, sentiment, richness, authority, social media usage, media exposure, and uncertainty, on the development of resilience. The analysis employed regression modeling and Cronbach's alpha to assess the model fit, mediation, and reliability of the constructs. Additionally, CVI was utilized to evaluate the content validity of the research instrument. The findings demonstrate strong content validity, with high levels of agreement among raters. Furthermore, the internal consistency of each variable satisfies the minimum standards, and the regression model is statistically significant, indicating a robust predictive capacity.

However, a key limitation of the study is the homogeneous nature of the sample, which consisted exclusively of male respondents within a specific age range. This limits the generalizability of the results to other demographic groups impacted by disasters. To address this limitation, the researchers propose to gather data from a larger and more diverse sample in future investigations. Additionally, the

study model suggests several characteristics of social media engagement, including duration, intensity, type (mode), content, frequency, and time distance. Building on these insights, future research could delve deeper into the substance of information-seeking behaviors on social networking platforms. Sentiment analysis could be leveraged to examine the content and intensity of stakeholder interactions, further enhancing the understanding of resilience-building processes.

Overall, the current study provides valuable insights into the multifaceted factors that influence resilience development. The robust methodology and findings contribute to the existing body of knowledge in this domain. However, the limitations identified underscore the need for continued research to expand the understanding of resilience in the face of crises, particularly across diverse populations. Additionally, since this is a pilot study, future research should collect data from a larger population to assess the reliability and validity of the proposed model.

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