Evaluating netizens' social media collaborative problem solving efficacy on disaster response phase of disaster management, in Nigeria.

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***Abstract*:** This paper presents findings and significant effects of social media collaborative problem solving possibility (SMCPS) on the three stages of disaster management i.e disaster preparedness (DPRE),disaster response (DRES)and disaster recovery (DREC) from a flood disaster occurrence in Nigeria.The study used a survey questionnaire and stratified random sampling technique to collect 384 primary data from flood disaster management agencies (OYSEMA, NiMET & Red-Cross Society) in Ibadan, Nigeria. The collected data were analyzed using Partial Least Square - Structural Equation Modeling (PLS-SEM).The study concludes that social media has become an important tool especially during emergency situation and disaster management.Hence, important implication of this study to the environmental regulatory policy makers and emergency response agencies is to create more awareness on the usability and organizational applicability of social media in providing credible information regarding disaster/ disaster management.

Index Terms: Social media collaborative problem solving possibility (SMCPS), Disaster preparedness (DPRE), Disaster response (DRES), Disaster recovery (DREC), Flood management.

1. INTRODUCTION

The advent of a plethora of social media including social network services, community contents, micro-blogs have changed the landscape of disaster management considerably over recent years with possibilities for social action now becoming realities (Zhang, C., Fan, C., Yao, W., Hu, X., & Mostafavi, A. 2019). With readily available software tools such as online discussion platforms and news aggregator, organizations, citizens and netizens can now disseminate, acquire and analyses information more efficiently and comprehensively(Fraustino, Liu & Jin, 2012; Bruns, A. & Stieglitz, S. 2012). The importance of social media in disaster is evident in the coordinating emergency services, offering support and disseminating medical related information by the emergency staff, military personnel and the general public (Toyosi, 2014;Houston, J. B., Hawthorne, J., Perreault, M. F., Park, E. H., Goldstein Hode, M., Halliwell, M. R., ... & Griffith, S. A. 2015). Social media has the ability to prevent a disaster from spiraling out of control. According to experts, disaster management can be categorized into three namely; disaster preparedness, disaster response and disaster recovery. Across these three stages, social media tools can be used for different purposes which include information dissemination, disaster planning and training, collaborative problem solving and information gathering etc (Zhang, C., Fan, C., Yao, W., Hu, X., & Mostafavi, A. 2019). These stages are coded (DPRE) (DRES) (DREC) respectively for the purpose of this study. Therefore, emergency and disaster management organizations involvement of the general public in disaster management is to ensure that the public gets accurate and complete information (Toyosi, 2014). Improving resident participation in disaster management is expected to increase the effectiveness of disaster management and reduce information gap.This is because the more engaged people are the more, they learn about how to prepare, respond and recover from disaster. In view of this, this study aims at examining the role of resident netizens' participation and collaborative problem solving in disaster response phase of flood disaster management in Nigeria.

2. RESEARCH QUESTIONS

What is the effect of netizens social media collaborative problem solving on disaster response phase of flood disaster management in Nigeria. ?

3. RESEARCH OBJECTIVES

This study is exploratory with a major purpose of collecting primary data on netizens' experience and participation via social media during flood disaster in Nigeria. Subsequently, the specific objectives of this study is 'To investigate the effect of netizens social media collaborative problem solving on disaster response phase of flood management in Nigeria.

4. PROBLEM STATEMENT

The continued propensity of flood incidents in Nigeria necessitated the establishment of additional institutions from the late 1990s to assists in flood disaster management in Nigeria (Obeta 2014). Subsequently, the National and State Emergency Management Agency (NEMA), the Federal Environment Protection Agency (FEPA) and the Nigerian Metrological Agency (NIMET) were unveiled. The N.E.M.A South West Zone covers Six (6) States which are: Lagos, Oyo, Ogun, Ondo, Ekiti and Osun. With an Operational Office in Ekiti which covers Ondo, Osun and Ekiti. (Nema 2014). NEMA is saddled with the responsibilities of reducing the impact, loss and damage incurred from disaster that may occur (NEMA, 2012). This involves with the plans of putting in place the necessary methods of responding to emergency occurrence. This method can be in form of an Emergency Response Plan (ERP), Simulation Exercises (SIMEX), training as well as early warning system. Inter-agency collaboration for emergency responses at national, state and local levels including civil society organizations and communication plans with easily understandable terminology and methods are all parts of NEMA's operational purview (Houston, J. B., Hawthorne, J., Perreault, M. F., Park, E. H., Goldstein Hode, M., Halliwell, M. R., ... & Griffith, S. A. 2015 & NEMA 2012).Conscious of prevailing vulnerability of local communities to weather and climate related hazards, the zone adopts various strategies in confronting these disasters namely; collaboration with State Emergency Management Agencies (SEMAs) and other critical stakeholders to intensify efforts in disaster management through comprehensive early warning messages, awareness creation, multi-stakeholder workshops and training and simulation drills (NEMA 2012).

However, NEMA is constantly faced with numerous types of challenges in course of implementing the aforementioned measures. As stated by (Obeta 2014 & Nema, 2012), the challenges faced by N.E.M.A in Nigeria are but not limited to : Information management, inadequate number of sustainable flood control strategies, Non adherence to safety standards , Absence of up-to-date flood control acts, Inadequate Funding & Logistics, Non conformity to Rules & Regulations, Crowd Control, Absence of prior planning that addresses issues which boost flood.

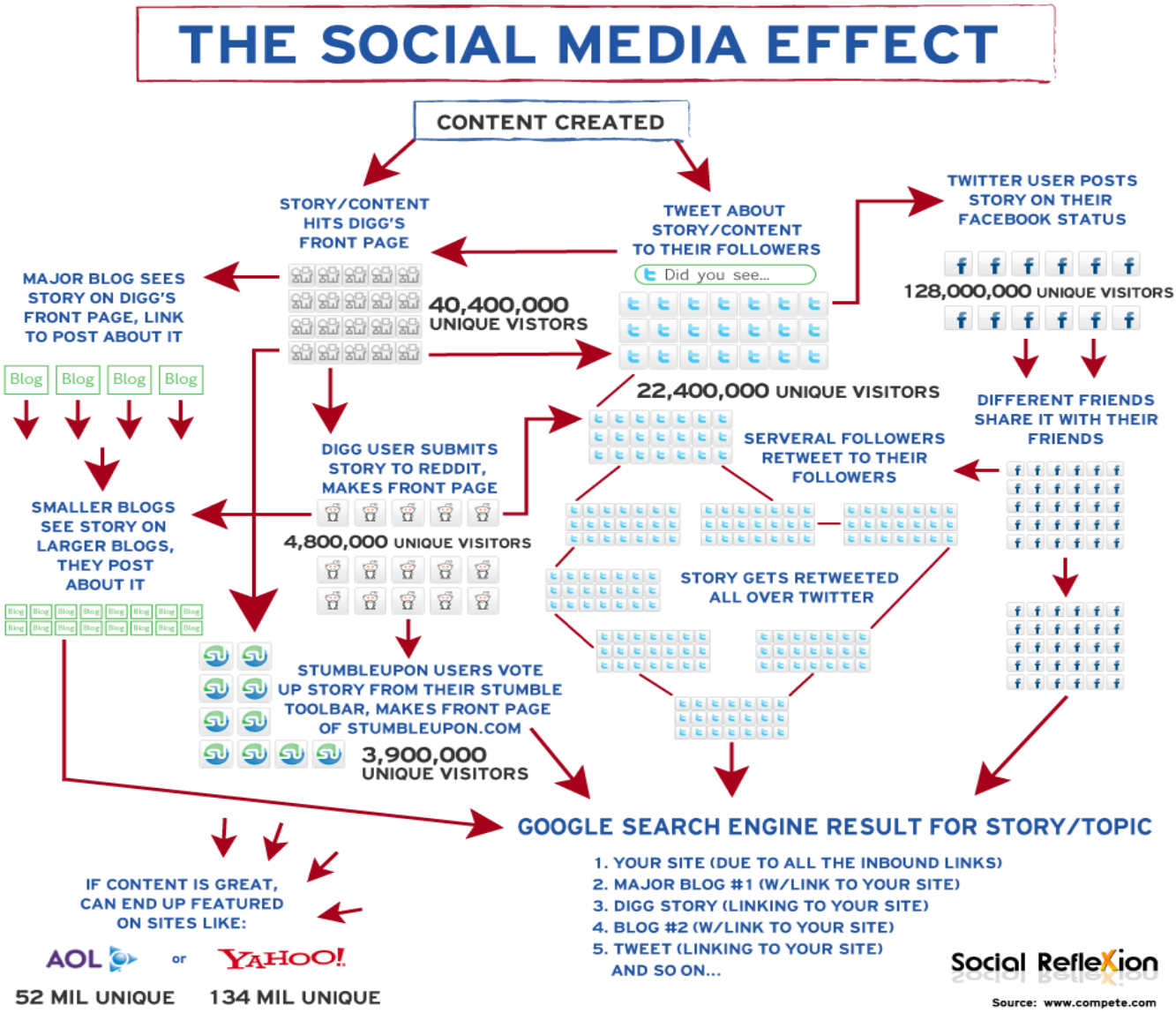
5. RESIDENT NETIZENS AND DISASTER'S MANAGEMENT: FUNCTIONALITY OF SOCIAL NETWORK SITES.

A disaster is a "serious disorder of the functioning of a community or a society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope using its own resources" (National Science and Technology Council, 2005, p. 21). Disasters, however, can generate crises for organizations when the residents become concerned not simply about the disaster itself, but also about how well organizations managed the disaster (Kim, J. H., Kim, M. S., & Nam, Y. (2018). Disaster communication deals with (1) disaster information circulated to the residents by governments, disaster emergency management organizations often via conventional and social network sites; as well as (2) disaster information created and shared by journalists and affected members of the residents often through word-of-mouth communication and social network sites.

Disaster emergency management is a process of attending to negative circumstances by governments, humanitarian agencies and individuals working together to reduce the potential losses resulting from disaster situation by developing policies and plans that can mitigate the effects, prepare for disasters and outline the procedures involved in responding to the victims in order to ensure quick recovery from the impacts (Sreenivasan, 2010; Warfield, 2008). Against the above backdrop, four major basic steps are involved in the disaster management process. These include mitigation, preparedness, response and repair(Jamali, M., Nejat, A., Ghosh, S., Jin, F., & Cao, G. 2019). In disaster management, Social network sites interaction can be seen in three dimensions. The first dimension is the interaction between emergency service agencies. The second dimension is the interaction between an emergency service agency and the community. The third dimension is the interaction between the communities amongst themselves (Jamali, M., Nejat, A., Ghosh, S., Jin, F., & Cao, G. 2019). The focus of this study is narrowed to the interaction of

residents' emergency service agency and the community, enabled through the functionality of the Social Networking sites as shown in Figure 1

Figure 1: Functionality of the Social Networking site



Source:megapowertech.blogspot.com (2016)

6. RESIDENT NETIZENS PARTICIPATION IN DISASTER'S MANAGEMENT IN SOME COUNTRIES ENABLED THROUGH THE FUNCTIONALITY OF SOCIAL NETWORKING SITES:

A: The infobanjir Malaysian App: This application provides location of information Centre of Evacuation Centre and Flood Level throughout Malaysia. The Infobanjir Malaysia app provides information such as the Disaster Relief Centers, Evacuation Centre and Flood Level nearby in every area, Road closed due to flooding, The system allows the public to obtain information relating to flood victims and location of evacuation centers using the App.

Figure 2:The infobanjir app Malaysia.
Source:Publicinforbanjir.water.gov.my.

Accessed on 9th August 2019

B:Wildfires (Red Cross) – USA: This app from the American Red Cross provides information about active wildfires in the US, as well as areas that are under official fire warnings. You can let others know you are OK with an "I'm Safe" alert.

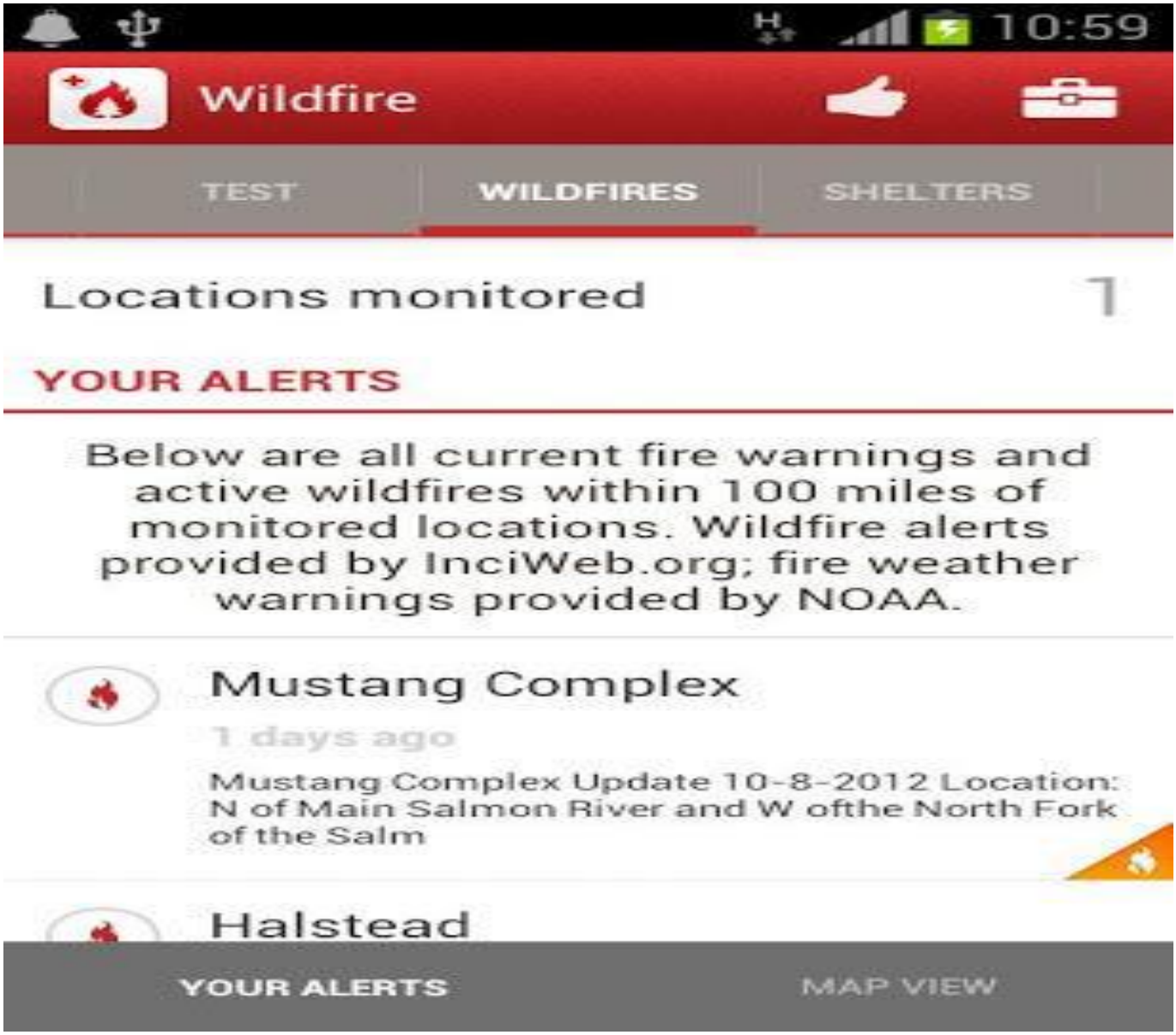


Figure 3: Wildfires (Red Cross) – USA
Source:cnet.com
Accessed on 1st November 2019.

C: Real time Warning – Global: The Real Time Warning app includes alerts and details about disasters around the world. Select an event and you can see its location, damage caused, severity, and impact radius on a world map. Tap one, and you see more detailed information, as well as quick links to share the news on social networks.

Figure 4: Real time Warning – Global

Source:cnet.com

Accessed on 1st November 2019.

7. THE ACTOR NETWORK THEORY IN THE CONTEXT OF DISASTER MANAGEMENT

The application of Actor Network Theory (ANT) in disaster management research explains the leadership organizations of disaster management (humanitarian) and organizational cooperation in managing and preparing for the unexpected occurrence of disaster (Ngamassi, L., Ramakrishnan, T., & Rahman, S. (2016). Actor network theory provides a sociologically based investigative tool with which to understand how disputes are resolved, new ideas become accepted; new tools and protocols are adopted and integrated by a group (Ngamassi, L., Ramakrishnan, T., & Rahman, S. (2016). Actor networks are comprised of technical and non-technical components.The observed performance of a sailing boat is a consequence to not only of its technological design features, but also the skills of its skipper and crew (Ngamassi, L., Ramakrishnan, T., & Rahman, S. (2016). This combination is also responsible for the boats behaviour. ANT acknowledges the heterogeneous nature of actor networks by linking the human and non-human, sociological and technological, thereby revealing issues at the socio-technical edge (Hanseth& Montero, 2004). In essence, actor networks entail elements that make other elements dependent upon them, and translate the will

of others to accept its own language. Practically speaking, these elements or "actors" can include humans, groups of humans, organizations, texts, images, and technical artefacts: the term "actant" is often used, in order to avoid differentiating between human and non-human actors.Importantly, all actants are deemed to have their own interests, leading them to desire the alignment of the interests of other actants in the network to their own. If they are successful in this endeavour they will have created an actor network around them, which can be defined as "a heterogeneous network of aligned interests" (Ngamassi, L., Ramakrishnan, T., & Rahman, S. (2016).

In disaster management context, the basic idea of ANT is that, in order to achieve a goal, a network of faithful alliances needs to be created to carry the network builders' intentions and materialize their goals (Ngamassi, L., Ramakrishnan, T., & Rahman, S. (2016).The theory holds a distinctive view of society as a network of humans and non-humans that interact and cooperate to pursue a certain goal. It therefore maintains that any network building would involve the recruitment of human and non-humans (Ngamassi, L., Ramakrishnan, T., & Rahman, S. (2016). ANT assumes that social and technical factors are inextricable. This means that people and artefacts are too closely linked to be separated and have to be analyzed within the same framework and context (Latour, 1987). The symbolic boundary between people and technologies is in a constant state of flux across a wide spectrum of contemporary work and leisure activities, and actor network theory offers one way to research the issues and dilemmas in this new globe.

In actor-network theory as articulated by Latour (1987; 1991, 1997b), technological innovation is viewed as an attempt to build and stabilize a diffuse system of allies composed of both human and non-human entities. This corresponds to a breakdown of the clear division between science and society, and it argues that there is no such thing as a social problem that does not have technological components, nor is there a technological problem that does not have social components. No project is purely technical, nor is it purely social. Actor network theory proposes the use of networks of interrelated human and non-human actors who shape the way things are, as 'actor-networks''. Hence, the theoretical perspectives of ANT are relevant to this study as the elements of ANT can be related to how the public, disaster management agencies and social media can form both human and non-human network to manage flood disaster.

8. HYPOTHESES DEVELOPMENT: NETIZENS PARTICIPATIONS AND SOCIAL MEDIA COLLABORATIVE PROBLEM SOLVING IN FLOOD MANAGEMENT

Research attention regarding public or popular use of social media in disasters has examined the kinds of content contained in messages that residents communicate. Some extant studies have also occurred in relation to the co-production of information in social media between members of the public and emergency management services during disaster events. Similarly, research by Chatfield, Scholl and Brajawidagda (2013) investigated residents' involvement in co-producing critical public information via social media. These studies have revealed that social media has been serving as a form of Social Media Information Dissemination, Social Media Disaster Planning and Training, Social Media Collaborative Problem Solving as form of residents netizens participation in disaster management. Hence, this study hypothesized that social media collaborative problem solving significantly influence netizens' participation in flood management. The following is the sub-hypothesis of this study:

H_a: Social media collaborative problem solving(SMCPS) significantly influence netizens' participation in flood disaster preparedness(DPRE)

9. METHODOLOGY

This study employed a quantitative research approach where a survey research design was used through which questionnaires was employed for data collection (Robinson, O. C. (2014). The research was conducted in a cross-sectional design in which data was gathered at a specific point in time for the achievement of the study objectives(Robinson, O. C. (2014). The target population of this study is the resident institution responsible for disaster management of flood in Ibadan, Nigeria. i.e the Oyo State Emergency Management Agencies (OYSEMA), Nigerian Meteorological Agency (NIMET), Red Cross Association, Oyo branch and the Department of Communication in the University of Ibadan, Oyo State. The Red Cross society Nigeria has about 350,000 volunteers throughout the 36 states in Nigeria with the Oyo State having about 3722 volunteers. Nigerian Meteorological Agency (NIMET) has a staff strength of about 500, while the Oyo State Emergency Management Agencies (OYSEMA) has about 150

employees. Hence, the total population of this study amounts to 4372.Table 2 presents the population distribution of the study and the percentage contributed by each agency.

AGENCIES	Population	Percentage (%)	Proportion Questionnaire distribution
OYSEMA	150	3.43	12
NiMET	500	13.43	49
Red Cross	3722	85.13	314
Total	4372	100	370

Population distribution of the study

The sample size of this study was determined based on the total population of the study using the formula provided by Dillman (2000) and Weaver (2006)

$$n = \frac{N(p)(1-p)}{(N-1)\left(\frac{B}{C}\right)2 + (p)(1-p)}$$
$$N = population\ \ size, \quad P\ \ = 0.5, \quad B = 0.05, C = 1.96$$

Note: n = *calculated sample size required for the desired level of precision*

N = *size of the population,*

P = *the proportion of the population expected to be chosen*

B = *the acceptable amount of precision or sampling error*

C = *is the K value associated with the confidence level.*

The simplified sample size table provided by Krejcie and Morgan (1970) and research procedure by Robinson, O. C. (2014) gave that for a population size of 4000, a sample size of 364 is required for analysis at +/- 5% error level while a population of 5000 requires a sample size of 370 respondents. Therefore, a sample size of 370 is regarded as appropriate for a population of 4372 in this study and hence, used for the data analysis in the study. As such, the unit of analysis in this study is the individual member of staff of the agency of the Oyo State Emergency Management Agencies (OYSEMA), Nigerian Meteorological Agency (NIMET), and the Red Cross Society of Nigeria (Oyo State Chapter). These individuals were chosen because they are responsible for the flood disaster management in Ibadan. From the total sample size of 370, a total of 12 questionnaires was given to the OYSEMA, 49 to NiMET while 314 questionnaires were distributed to the Red cross society of Nigeria based on the proportional contribution of the agencies to the total population. The distribution of the questionnaire is presented in Table 2 above. The primary data collected in this study was analyzed using both the descriptive and the inferential statistics. The main data analysis was done using the partial least square – structural equation modelling (PLS-SEM). However, a number of preliminary activities (data screening) were conducted using the Statistical Package for Social Sciences (SPSS) version 25 software prior to the main data analysis. The essence of this was to ascertain the suitability of the collected data for the main data analysis.

10. TEST FOR HYPOTHESES AND FINDINGS

The result of the test of hypotheses and the structural model of the study are presented in this section. In achieving this, PLS path modeling multiple regression approach was used to test the effects of the exogenous variables on the endogenous variables using the bootstrapping technique in PLS to analyze the path modeling using 384 cases and 5000 bootstrapped samples to ensure that all the model parameters have empirical sampling distribution and standard errors were obtained. The path coefficients were estimated using t-statistics. According to Churchill (1979) and Sharma (2000), in a situation where a one-tailed statistical test is conducted, the significance level of t-value of 1% is greater than or equal to 2.326, at 5% is greater or equal to 1.645 while at 10% is greater or equal to 1.282, any t-value lesser than the stated are regarded as not significant.

The hypothesis of this study between social media collaborative problem solving (SMCPS) and resident netizens' participation in flood disaster management hypothesizes that

H_a: Social media collaborative problem solving significantly influence netizens' participation in flood disaster preparedness

The findings of the study as shown in Table 4 revealed the standard path coefficients (β), standard error, t-value and the decision taken in this study. The findings shows that the stated hypothesis (SMCPS -> DPRE; β = **0.133,**t = **1.581**, P < 0.10) shows a significant relationship between social media collaborative problem solving and resident netizens flood disaster management,

Hypotheses	Path Coefficient	Beta	Std.Err	T-Statistics	Decisions
H_a	SMCPS -> DPRE	0.135	0.087	1.581	Significant

11. SUMMARY OF THE FINDINGS AND RECOMMENDATIONS

The objective of this study investigated the effect of social media collaborative problem solving (SMCPS) and resident netizens' participation in flood disaster management. The study found a significant influence of social media collaborative problem solving (SMCPS) on residents' flood disaster preparedness (DPRE) .These finding implies that improvement in netizens social media use in collaboration to solving problems will improve the preparedness to flood disaster management in Ibadan, Nigeria and vice versa. The standardized beta value of the path co-efficient indicates that social media collaborative problem solving will improve flood disaster preparedness by 13.5%. The descriptive analysis of disaster response revealed that managing recovery operation in an organized and effective manner has a mean value of 2.85 indicating that the residents of flood prone area in Ibadan are undecided regarding the use of social media during flood disaster. Therefore, this study recommends that governments and disaster managements should encourage the use of social media information gathering, dissemination and collaborative problem solving (SMCPS) among the residents through policy making, awareness creation to promote the ways by which disasters are being managed especially in flood disaster preparedness stage.

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