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Role of Social Networking in Disaster Management: An Empirical Analysis

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ABSTRACT

Disasters, be it natural or technological, are usually unpredictable and managing disasters needs to be timely. The development of social media, in particular social network such as Facebook and Twitter, since the past two decades has enabled people to interact and share information through the internet. Furthermore, it helps transforming people from content consumers to content producers. Data collected was analysed using smartPLS 2.0 statistical software. The findings indicate that teachers perceived role of social media in supporting disaster management on the five-dimensional constructs: Collectivity (CT), Connectivity (CN), Completeness (CS), Clarity (CS), and Collaboration (CB). The findings serve as a foundation of knowledge for future planning of disaster management education towards improving the teaching and learning of disaster management with social networking.
Keywords: Disaster Management, Crisis, Education, Social Networking, Empirical Analysis, smartPLS, Statistics

INTRODUCTION

Disasters, be it natural or man-made, are unpredictable and managing disasters needs to be timely. In all the four phases in managing disasters, which include preparedness, mitigation, response and recovery, information about the situation at hand is important for the relevant parties to make appropriate decisions and to plan actions. The timeliness and accuracy of such information are necessary to reduce the impact of the disasters, especially in saving lives.

Since the development of social media, people have been able to interact and share information through the internet. In the past few years, this initial role as a means to keep in touch with friends, family and colleagues has evolved and they are becoming a more important means of communication during emergencies and disasters. The wide use of social network, especially Twitter, in disaster management has been reported during the 2007 Southern California Wildfires in USA, 2008 Wenchuan Earthquake in China, 2009 Red River Flooding in USA, 2010 Yushu Earthquake in China, 2010 Haiti Earthquake, 2010 Mount Merapi Eruption in Indonesia, 2011 Great East Japan Tsunami in Japan [3] as well as 2011 Tuscaloosa and Joplin Tornados and 2011 Hurricane Sandy in USA [4]. [13] reported that in the cases they have analyzed, news have been reported in Twitter before appearing in traditional media, strengthening the potential of social media as communication and information channel during disasters.

According to [2], the increasingly significant role played by social media in disaster management has been attributed to their five distinct characteristics which include collectivity, connectivity, completeness, clarity and collaboration. He explained that the collectivity nature of social media allows people across geographical boundaries and time zones to get connected via common platforms; their connectivity feature allows users to be connected to other resources through the sharing of web links; their completeness captures and keeps

contributions to allow others to view and share; their clarity feature refers to the highly visible content and, last but not least, their collaboration attribute encourages users to share and contribute in areas they are interested in. Thus, social network allow firsthand reporting as well as instantaneous sharing and resharing of news. This unofficial means of communication, which is also referred to as "backchannel" communication, also prompts feedback and discussion, thus providing the public the opportunity to engage actively in the creation of information rather than just mere passive consumers [9].

The advancement in technology has made the active role of social network in disaster management more timely and significant. The extent ownership of mobile devices, such as smart phones, laptops and tablets, allows the owners to document events and to log on to any desired social media application when the necessities arise. The availability of many social media client application enables users to post or receive disaster related information timely from and to their mobile devices [3]. Furthermore, as pointed out by [6] in his work cited by [7], social media even works when other modes of communication fail, as often is the case in disaster situations.

As we are experiencing climate change today, the frequency of natural disasters has been observed to be on the rise. [2] pointed out that no matter when or where a disaster strikes, children and youth are among the most affected. And, according to International Strategy on Disaster Reduction [5], children who are taught about natural hazard risks play an important role in saving lives and protecting members of the community in times of disaster. Thus, there is a need to introduce disaster risk reduction (DRR) in the school curricula to empower children and their communities to be better prepared before, during and after these hazards. However, in the compilation of national progress reports on the implementation of the Hyogo Framework curriculum indicator, 2009-11, [11] reported that

just over half of the 70 reporting countries relate the inclusion of DRR-related themes and topics, mainly at the primary level. Thus, the inclusion of DRR knowledge in relevant sections of school curricula at all levels needs to be enhanced further in line with the Hyogo Framework for Action (HFA) 2005-2015 [7].

Over the years there had been a massive revolution in the way the communication flows. The once passive and one way directional flow of communication has evolve into active multiple participative communication flow affordances. This is the birth of social media (e.g. Facebook, Twitter, Instagram, etc.) wherein the information is shared and flows to the network of a particular media. This form of communication between the generator of information and the information consumer is inevitable. Hence, the use of such form of communication in other fields of human endeavors is being explored. Disaster management is one of such fields where the use of social media is being look into to harness its potentials. According to [7] as cited by [8] one of the undeniable significance of social media works when other modes of communication fail, as often is the case in disaster situations.

There had been numerous research studies on social media, its role, importance and contribution in disaster management. An analysis of Twitter content presented by [8] as cited by [4] shows that "disasters & accidents (including terrorist attacks or shootings)" as a category of events is the second popular after sports events being posted online. Furthermore, in the analyzed cases news before it appeared in traditional media it was reported first in Twitter. Also, emergency managers had the abilities to communicate, interact with, and respond to the public on a hitherto unseen scale given by the affordances of Twitter and other interactive social media [8].

As reported in the study by [11] quite a high share of respondents claim that they use social media and express their willingness to use it for crisis management purposes. As an example, by commenting on blogs and other networks it shows concern and gives the impression that an organization (or person) is not shying away from discussion about the incident at hand [7][10][11]. There had been a consensus among research participants in the study by [11] which considered social media as a good communication channel both for distributing and receiving information during crisis situation. Such an example is the research by [3] which provided clear evidence especially on the two desired characteristics of disaster early warning systems, reach and speed of communication for which the utility of Twitter network as tsunami early warning was utilized. Hence it only proves the potential of social media as communication and information channel during disasters [11].

[7] presented the following recommendations in incorporating social media tools in risk and crisis communication in order to harness its optimum potentials:

1. Determine social media engagement as part of the risk and crisis management policies and approaches;
2. Incorporate social media tools in environmental scanning to listen to risk and crisis bearer concerns;
3. Engage social media in daily communication activities;
4. Join the conversation, including rumor management, and determine best channels to reach segmented publics;
5. Check all information for accuracy and respond honestly to questions;
6. Follow and share messages with credible sources;
7. Recognize the media is already using social media;
8. Remember social media is interpersonal communication;
9. Use social media as the primary tool for updates;
10. Ask for help and provide direction; and
11. Remember web 2.0 is not a Panacea.

It is with no doubt that with tapping the appropriate potential of social media in disaster management a risk will be reduced if it can't be eliminated. In order to attain this, an extensive research in this field is needed so that knowledge will be generated on how best we can harness the social media potential towards this end.

RESEARCH QUESTION & FRAMEWORK

This section describes the research question, the conceptual framework and elaborates on data collection procedures.

Research question

As stated earlier, this paper aims to report on the usage of social networking for disaster management in India (please check) . Hence, the research question is as follows:

Among the four constructs, flexible delivery, content knowledge presentation, knowledge reception and access methods which contributes towards personalized science learning? Based on the research question, the following hypotheses are derived:

H1: Social Networking promotes Disaster management through Collectivity.

H2: Social Networking promotes Disaster management through Connectivity.

H3: Social Networking promotes Disaster management through Completeness.

H4: Social Networking promotes Disaster management through Clarity.

H5: Social Networking promotes Disaster management through Collaboration.

Conceptual framework of the study

The following variables are identified to the framework of study:

Figure 1. Proposed research framework for Social Networking. In this study, Social Networking (SN) is derived from existing literatures and adapted for discussion in the analysis of items in the instruments.
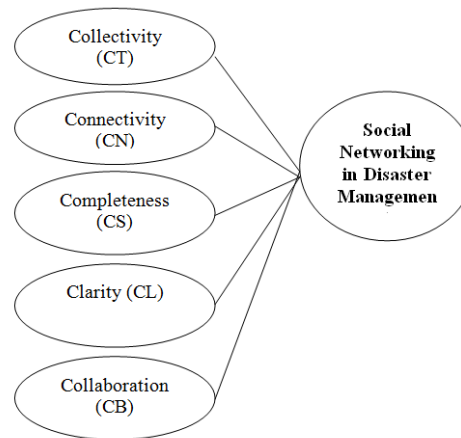

Table 1: Sources for study's variables

Constructs	Description	Hyp
Collectivity (CT)	Collective nature of social media serves to connect people across geographical boundaries and time zones via common platforms, to foster online communities with similar interests	H1
Connectivity (CN)	.Unlike other forms of media or communications, social media is able to connect users to other resources through sharing of web links	H2
Completeness (CS)	Social media is able to capture contributions and keep them in persistent state for others to view and share	H3
Clarity (CL)	Content on social media is highly visible	H4
Collaboration (CB)	People are encouraged to share and contribute areas they are interested in, by gathering information and feedback	H5

Sampling, instrument, variable measurement and data collection procedure

The survey method using convenience sampling was employed. A survey instrument was designed to develop a research model based on the framework identified as shown in Figure 1. Table 1 shows the study's variables with descriptions of the four constructs. Following the suggestion of [11], the study consists of 20 questions to measure the constructs relevant to this study. Each question was measured by a five-point Likert scale. For instance, '1' denotes 'strongly disagree', '2' denotes 'disagree', '3' 'denotes 'agree' and '4' denotes 'strongly agree'. Table 2 shows an item for each dimension in the questionnaire and demonstrate the outcome of

convergent validity and internal reliability for indicators. The survey questionnaire was validated by three academics prior to upload online.

The subjects under study were educators from India who have contributed through online survey form. A total of 80 survey feedback forms were received out of which eleven incomplete feedback forms ignored. Hence, the response rate of 86%. The respondents comprised of 49 male (70.5%) and 20 female (29.5%) participants, 52% of the respondents have Masters degree and the rest (48%) have Bachelors degree.

Data analysis was performed using a structural equation modeling partial least squares (SEM PLS) with indicators in SmartPLS M3 [13]. The PLS technique has become progressively more accepted in empirical research, and is easy to analyze small samples [13][14].

RESULTS AND ANALYSIS

To assess the extent and the specific nature of disaster management, the different dimensions and role of social network from the research question was taken into consideration. A direct and an indirect (i.e. moderated) measurement model of the dimensions such as Collectivity (CT), Connectivity (CN), Completeness (CS), Clarity (CL), and Collaboration (CB) are defined as shown in Table 2 and Table 3.

Direct Effects, Reliability, Convergent and Discriminant validity

The reliability was assessed by calculating Cronbach's alpha values. The values range from 0.729 to 0.891. For convergent validity, the item-to-total correlation was evaluated, based on the correlation of each item to the sum of remaining items. The approach assumes that the total score is valid and thus the extent to which the item correlates with the total score is indicative of convergent validity of the item (Table 2). The values range from 0.611 to 0.876.

Discriminant validity was checked by using a factor analysis. In Table 2, discriminant validity was confirmed when items for each variable loaded onto single factors with factor loading greater than 0.7. All the reliability, convergent and discriminant validity values were within the acceptable level of fit [13].

Table 2: Psychometric table of measurements with its Reliability and Validity (n=69)

Measures	Item	Mean	SD	Reliability	Convergent Validity	Discriminant Validity
CT	4	4.11	1.22	0.846	0.611,0.649,0.617,0.702	0.721,0.769,0.818,0.938
CN	4	4.22	1.18	0.891	0.622,0.616,0.642,0.726	0.711,0.789,0.808,0.826
CS	4	4.42	1.17	0.729	0.636,0.614,0.617,0.739	0.761,0.778,0.817,,0.914
CL	4	4.36	1.28	0.811	0.615,0.676,0.674, 0.734	0.726,0.849,0.844, 0.811
CB	4	4.28	1.11	0.779	0.675, 0.876, 0.690,0.777	0.80

Table 3: Direct and Moderated Path Analysis Results (n=69)

Structural Relation	Model 1 (Direct Effects) Path Coeff. Sig. Cont R^2			Model 2 (Moderated Effects-Gender) Path Coeff. Sig. Cont R^2		
CT->SN	0.5621	**	17.14%	0.5604	**	16.32%
CN->SN	0.4211	***	17.30%	0.4317	***	18.02%

CS->SN	0.5173	**	22.22%	0.5251	**	21.11%
CL->SN	0.5004	**	20.10%	0.5040	**	20.45%
CB->SN	0.5661	**	16.17%	0.5622	**	17.10%
			100%			
Interaction Construct Item 0.1328				2.14%		
			100%			
R^2 0.5176						0.3766
Adjusted R^2 0.5919						0.3417

Significant level: **p<0.05; ***p<0.01; Cont R2=Contribution to R2

Moderated Effects

The results in Table 3 demonstrate that the standardized beta coefficients for the four constructs. The inclusion of the interaction term shows a smaller beta of 0.1328 for the moderator namely the gender and R-Square for gender (2.14%) results augurs with the expectation of [13]. He suggested that the variance in the endogenous construct explained by any one individual path should be more than 1.5%. The contribution to R-squared illustrates the importance of each construct and its relative contribution to overall R-squared.

To decide the potentiality of the interaction term (i.e. Gender) the proposed model's effect size needs to be calculated. This is assessed by contributing R2s of the main effects and interaction's model (Table 3) using the Cohen (1988) effect size formula:

f2Gender = f2model with moderator - f2model without moderator /1 - f2model with moderator

i.e. f2Gender= [0.5919 – 0.3417]/1-0.5919 = 0.6113

[16] Suggest the moderating effects with effect size (f2) when an interaction is small (0.02), moderate (0.15), and large (0.35) respectively. As per the above results, the interaction term, gender (f2Gender= 0.6113) acted as a potential moderator and moderated the relationship between the five constructs and social networking. It is noted that a small f2 does not necessarily imply an unimportant effect. "If there is a likelihood of occurrence for the extreme moderating conditions and the resulting beta changes are meaningful, then it is important to take these situations into account [17]. As indicated by the results in Table 3, the hypotheses H1, H3, H4 and H5 are accepted (p<0.05), and hypothesis H2 is also accepted (p<0.01).

LIMITATIONS AND FUTURE WORK

The survey instrument was designed to develop a research model based on the framework of using social networking for promoting disaster management through collectivity, connectivity, completeness, clarity and collaboration [11]. The survey feedback was derived from small convenience samples of educators from India. Hence the scope of the data and its analysis were rather simplistic. However, if there was more time to gather feedback from stratified sampling of the larger population in wider geographical areas, the results would probably offer more generalizable and significance findings. In this connection, if a comparison of the same study is to be carried out in larger countries such as Bangladesh and Indonesia, and in smaller nations like Malaysia and New Zealand, the feedback may reveal different degrees of preparedness in using social media in disaster management.

CONCLUSION

Social media is produced using people-generated content compared to professional media such as television and magazines adopted in traditional media. Results of this small-scale survey in only one location indicate that Indian educators revealed the importance of social networking's role in disaster management. This paper proposed a framework to indicate the characteristics of social networking in disaster management. It postulates that social networking promotes disaster management through collectivity, connectivity, completeness, clarity and collaboration. Social networking makes sharing of news and information simple and easy by sharing of web links. In fact, social networking connects people all across the world with information via same platforms of communication where users are able to post and receive disaster related information in a short time [3]. When other modes of communication fail during disaster situation, social networking plays an important role in connecting users with resources [7][8]. However, since the content of information is highly visible and complete users' responsibilities in sharing and reading the right information should be emphasized. As recommended by [8], social networking can be used to manage disaster but information accuracy needs to be identified. Users should strictly respond and follow only credible sources. Furthermore, social media enables us to demonstrate thought leadership, drive people towards content and information, provide real-time support to public and increase the possibility of online visibility and credibility.

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