Developing a Survey for Assessing Infostructure in Disaster Management

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Abstract: This study describes the development of a survey questions to assess the implementation of infostructure among disaster management agencies. A review of the literature has produced the finalization of three dimensions in disaster management that is important to a successful implementation of infostructure in disaster, namely coordination, communication and control. A suite of questions designed to assess these dimensions was devised and will be subjected to expert validations from relevant disaster background. The validations were used in refining the language and phrasing of the questions. The study concludes that a refined survey measurement of the concept of infostructure is possible and will be useful for future research in disaster that relates to an electricity company.

Key words: Disaster management, information sharing, pilot testing, concept, future

INTRODUCTION

Disaster management relies heavily on the use information in ensuring all the processes during the event of a disaster is being carried out, in order to prevent any casualties or damage to properties. In the context of disaster management, a new term of infostructure has been defined to encompasses all aspect of information used in disaster. Infostructure in the domain of disaster management is defined as information created and used in activities of disaster management that includes soft structures elements that promote information sharing by delivering content and resources to stakeholders via a coordinated approach. The created information that equipped with ICT (Information and Communication Technologies) infrastructure, including structure and technology is ready to be passed to all relevant disaster agencies (Latif et al., 2015). The infostructure in the context of disaster management need to be measured as the agencies need to see the improvement on how the infostructure is being used throughout the entire phases of disaster management.

In the occurrence of a disaster, information is crucial in ensuring the right response is delivered to the victims at the right time. The interest in devising measures of the improvement of infostructure has motivated this study arose in the context of the development of an Infostructure Maturity Model for electricity company. The measurement of infostructure was devised to monitor all the three selected processes in disaster management, namely coordination, control and communication, called the 3Cs.

Literature review: The selected processes in disaster management that is the focus of this survey are coordination, control and communication, as stated in research by Latif et al. (2015). Each processes is discussed briefly as.

Coordination: Coordination is required in any disaster activities, as multiple agency will respond to any event of a disaster. Without coordination, vital information could not be shared across agency and this may delay their collaborative work in performing decision makings and action. As seen in flood in Malaysia happened recently in 2014 with a guidelines to be followed, there still need to be proper coordination from the authority involved, to the flood agencies including the electric company. Without coordination, the delivery of rescue and relief efforts to the victims will be delayed. The flood disaster was of a big magnitude and was a sudden event that caused the disaster management team to be overwhelmed as they were one of the affected victims. As they were the focal point of the information relay, no updates on the disaster can be disseminated to the other disaster agencies. Without these information, the right types of rescue and relief activities could not be provided to the victims. The local electric company has stressed out the importance of having close cooperation between them, the government authorities and relevant disaster agencies in passing information that may be used in controlling the disaster.

Communication: The latest technology in communication has seen an increase of communication channels that

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distribute information in variety of media which includes traditional (radio, television) as well as new media (Internet, satellite radio, social media). It has play a major role in educating the public on the risks of a potential or impending disaster as well as delivering information to the public during the event of a disaster. In the case of Malaysia, a relief effort can only be made possible by having a collaboration of multiple agencies. Although, the practitioners realize the importance of having collaboration among agencies, the efforts were not possible due to the lack of communication across agencies. Typically, information created for an agency is not shared across agencies as stated in an article by Ahmad *et al.* (2014). The information flow from one agency to another is neither well-defined nor well-documented that caused the information-sharing process are not transparent among the agencies involved. Lack of communication across agencies can be seen from the recent flood disaster that hit Malaysia where information are created for a particular agency without sharing the information with others that might facilitate the disaster management process.

Control: Disaster management relies heavily on collaborative efforts that is joined by numbers of agencies and each agencies have its own roles and responsibilities. In Malaysia, disaster management effort is divided into three levels with different stakeholders with specific roles and responsibilities. This structure was based on Directive No. 20 that was published by the National Security Council of Malaysia. By listing roles and responsibilities, along with the authority of each level and agencies under these levels, it is evident that proper governance structure is crucial is governing the stakeholders that are involved in a disaster management.

MATERIALS AND METHODS

Developing the instrument: The survey questions to be developed for the infostructure concept is relatively new and unfamiliar territory as infostructure in this paper was defined for the context of disaster management. Selected literatures from the 3Cs were reviewed in order to identify the most suitable questions to be included in the survey. The first C, coordination, was based on the content from the study of Seppanen and Virrantaus (2015) that explain the importance of having a timely and accurate information for all the relevant agencies in responding to a disaster. As in any event of disaster, multiple agencies will be involved that affects the complexity of the response processes and the information required to manage the efforts of all the agencies.

All these information will then be communicated to the next hierarchy level or to other agency, as defined in infostructure which stated that information need to be passed to the next hierarchical level in the disaster management activities. This component also was supported by the research of Raju and Beeker (2013) that stated that coordination is important in any disaster efforts, along with the use of effective policy and practices in ensuring information and resources can be distributed to the victims. The second C, communication which heavily focus on the usage of social media was based on the research of Alexander (2014) that explains on the potential of using social media in disaster situation. As in an event of disaster, typically information could not be shared, the lack of communication cause the agencies involved to not knowing where to provide help and to be updated of the status of the place being affected by the disaster.

The third C, control was needed in any disaster efforts as there is a need for an authority to govern all the activities in a typical disaster management activities. Suitable roles and responsibilities need to be identified in ensuring that information can be passed to the right agencies at the right time.

Survey domains and subtopic: The survey contains the entire 3 domain of the 3Cs which will include relevant subtopics on the final instrument. It relates the infostructure usage by related disaster agencies that are involved in disaster management, focusing on agencies that are involved in disaster affecting electricity companies. The target respondent for the survey are five organizations that directly involved with the electricity companies in the event of a disaster which are fire department, land office, irrigation and drainage department, civil defense and the electricity company itself. Based on an interview with the electricity company (state division), only these five disaster agencies were selected as they are the main responding agencies if any disaster affects the electricity company. The survey is divided into three sections which the first section on the respondent profile, the agencies profile the respondent belongs to and the current infostructure usage in the agencies. The first section only need the respondent to provide their details on their working details and experience in the disaster agency.

It will contain questions that may include the disaster agency involvement in disaster management practices in Malaysia. The agency need to indicate the nature of their organization that is either government or non-government agency with its years of experience in managing the disaster. The agency also need to indicate
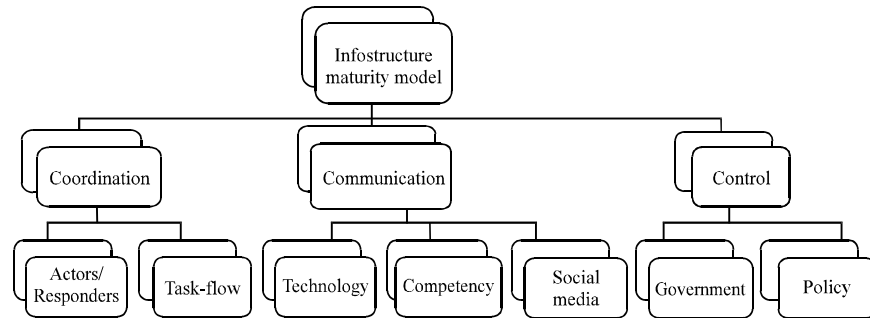
Fig. 1: Indicators that belong to the 3Cs (coordination, communication and control)

Table 1: Definition of 3Cs

Processes	Definition
Coordination	A disaster is a complex task environment that requires multiple organizations to be involved in decision-making. Reliable and relevant information need to be collected from relevant agencies in responding to disaster
Communication	Information and Communication Technology (ICT) is important in disaster management as it can be used as one of the medium in disseminating information to the public in any phases of the disaster, from the mitigation to the relief phase
Control	Control is required to govern the stakeholders that are involved in a disaster management that will ensure sound coordination and clear roles and responsibilities in communication

in which phase that it involve during a disaster which may one of the four phases of disaster, that are preparedness, mitigation, response or rebuild/recovery.

The survey consists of 7 topics that belong to the 3Cs, as shown in Fig. 1. All the topics will have its own set of indicators that ranges from 2-5 indicators for each of the topic that may facilitate the disaster management process.

Organization of survey: The survey was organized according to the 3Cs, followed by topics that belong to each of the C (Coordination, Communication or Control). Each of the 3Cs will be provided with its own definition, in order for the respondent to understand how the process is involved in disaster management before they start to answer the survey, as provided in Table 1.

Each of the topic is broken down into indicators that belongs to the topic. These indicators are given rating scales to measure the respondent attitudes and beliefs in infostructure usage in disaster management. Infostructure usage will be measured by asking respondents in all aspects of infostructure that will encompasses the information use in the activities of disaster management, the structure or platform of the information and the technology used to create, store or disseminate the information.

It will be assessed by asking respondent to assess all the indicators of the 7 topics identified above using the 5-point Likert scale. To answer the survey, respondents will indicate their agreement with each indicators using a five-point scale from 1 (anchored with "Strongly disagree")-5(anchored with "Strongly agree").

RESULTS AND DISCUSSION

Using face validity as validation of the survey instrument: The maturity model is designed to specifically focus on the domain of disaster management and it should reflect the needs and procedures for activities that occur in the event of a disaster. The developed survey is validated by adopting the method used by Khoja *et al.* (2007) which used a mixed methods approach of sequential exploratory design. Khoja used face validity approach through in-depth semi-structured interviews to test the survey. his research applied face validity approach using two group of experts.

The process of validation is done by measuring the face validity of the survey instruments, whether the items appear on questionnaire is what the scale supposed to measure. The face validity is aimed in ensuring the content and wording used in the survey are free of errors and also to revise and examine the questions in terms of meaningfulness, relevance and clarity (Shaltoni and West, 2010).

The experts chosen are competent in the domain of disaster management, both from academic and practitioner. Reviews from academicians is required as they have the experience and knowledge related to survey instruments and involve in disaster management research. In the other hand, practitioners input is essential in implementing the face validity as they have first-hand knowledge in on practices as well with experiences in managing real disaster.

CONCLUSION

The purpose of this study is to present the development of survey that will be used to assess a maturity level of infostructure in dealing with disaster management. The proposed infostructure maturity model can be used to assess key elements of infostructure (information, systems and technologies). The survey was developed to assess the infostructure usage at an electricity company and will be applied as a tool to monitor the three selected processes in disaster management which are coordination, control and communication.

The next step in the process of developing survey questions on infostructure was to verify the content of the survey to a set of expert validators in assessing the suitability and accuracy on the questions asked in the survey. Results from this survey will be constructive in driving the development of effective processes, policies and procedures to improve the infostructure usage in disaster agencies, in order to promote a better relief and rebuild efforts to affected victims.

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