Knowledge Management in Disaster Preparedness: An Analysis of 7.0 Magnitude Earthquake in 2022 Luzon Philippines

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Abstract

In the past decade, reported disasters are becoming more severe and the number of deaths also increases. The impact of disaster could be reduced significantly with enough disaster preparedness. Most recently, knowledge management has become a key part in disaster management specifically in the disaster preparedness phase. The aim of the study is to explore how individuals and the communities applied their knowledge in disaster preparedness. A survey method was utilized to measure their disaster preparedness before, during and after the Luzon, Philippines 7.0 magnitude earthquake last July 2022. From the 46 randomly selected respondents that experienced the said earthquake, the results showed that the majority of the respondents have information about disaster preparedness. Social media is the biggest source of disaster preparedness information. Roughly, 63% said they have attended training for disaster preparedness in an earthquake. Around 37% of the total respondents stated that they understand disaster risks and disaster-prone locations. Roughly, 30% said they knew the evacuation routes and evacuation procedures in which they lived. During the earthquake, the majority of the respondents were inside a building where they work. Around 96.6% of the respondents took cover under the table to protect them from the earthquake. After the earthquake, the majority of the respondents seek a safe place. It is recommended to have an improved disaster preparedness design to increase participation in disaster preparedness activities.

Keywords
Knowledge Management, Disaster Management, Systematic Literature Review

1. Introduction
The impact of disaster could be reduced significantly with disaster preparedness. Disaster more recently has become more severe and the number of deaths increases thus, affecting more people and disrupting their way of life. Nations around the world faces significant challenges in terms of its vulnerability to natural disasters. This vulnerability needs effective disaster management to lessen the impacts and ensure correct responses efficiently (Pathirage, Seneviratne, Amaratunga, & Haigh, 2012). Knowledge management is about acquiring the right knowledge appropriately. The purpose of knowledge management is to facilitate the process of creating, sharing and using the knowledge. Natural disasters could not be avoided but its impact could be neutralized, thus efforts must be exercise to mitigate its effect. Knowledge disaster management strategies could increase informed mitigation and develop more effective preparedness planning. Lessons learned in training and simulation in disaster should be apply in actual situations (Oktari, et al 2020). Disaster management practitioners should consistently improve their knowledge and skills, these could be achieved through investments in systems, network structures and databases to have a culture of learning from past experiences. Likewise, the current best practices utilized in disaster should be reviewed (Kusumastuti, et al. 2021) and constantly updated to adopt to changes. Information in disaster management is fragmented (Oktari et al. 2020), there is a gap in sharing information in the aspect of disaster management strategies.

1.1 Objectives
This paper examined the use of knowledge management in different phases of disaster management to validate the benefits of knowledge management in the reduction of disaster impacts as well as improving disaster resiliency. This

research will answer the following questions: i) What Knowledge Management practices are being utilized in disaster management? Ii) What are the involvement of Knowledge Management on disaster management performance?

2. Literature Review
2.1 Knowledge Management and Disaster Management
2.1.1 Knowledge Management
Knowledge management is a scientific discipline that has been in development for the past decades. Knowledge management is not only for academic purposes but also has been a significant component in organizational life. In different fields of sciences, knowledge management is being applied to manage, create and improve intellectual assets (Oktari, Munadi, idroes, & Sofyan, 2020). KM is also mentioned in other fields of disciplines such as information technology, communication and social sciences (Serat, 2017).

Serat, (2017) define KM as the combination of systematic and explicit information management that allows the identification, storage, creation, sharing and utilization of knowledge resources individually and collectively. KM, likewise could be used to simplify the process of sharing information and understanding of it as well (Gao et al. 2008). The literature in knowledge management focused on the facilitation of creation, storage and transfer of knowledge. Furthermore, in the study of (Greiner, Böhmann, & Krcmar, 2007) it addressed how organizational environments influence the knowledge management strategies selection.

KM implementation could be classified into three elements namely; people oriented, process oriented and technological oriented (Oktari, Munadi, idroes, & Sofyan, 2020). Literature suggests that process oriented knowledge management practices had the concept of KM needed at the upper level of the organization. The idea is to put all the needed management process-oriented KM in one place to further the performance of an organization. In the aspect of people-oriented studies in KM practices it is highly connected with innovation, several researches indicated that the use of people-oriented KM increased acquisition, distribution and creation of knowledge processes that impacts innovation skills. Researchers state that technological oriented KM primarily deals with knowledge acquisition, creation and sharing that elevates an organization's performance through readiness and innovations.

2.1.2 Disaster Management
Disaster is defined as the sudden disruption to a society that disrupts a community that affects human, economic, material and environmental (United Nations, 2009). In disaster management, knowledge management in recent years has become a significant component (Kusumastuti, Arviansyah, Nurmala, & Wibowo, 2021). (Spiekermann et al, 2019) Learned the facets of knowledge that strengthens individual and institution learning necessary to determine adjustments in social and functional issues in disaster risk reduction. In this section the extant literature on knowledge management in disaster management has been examined. Table 2 below is a brief description about the paper reviewed with the main objective of the study, its significant findings, key themes and in which phases of disaster management it is applicable/applied. Training and education in post disaster construction was examined on how it will be utilized to develop recovery awareness (Opdyke et al. 2017). The significance of knowledge transfer was highlighted by (Kusumastuti et al. 2021) (Gundran et al. 2022, Pribadi et al , 2021). Moreover, (Lee, 2020) in his study indicated that having knowledge in disaster management increases collaboration among the communities and government officials. In the study of (Ali et al. 2020) they indicated that a mechanism should be in place in the distribution of data gathered during post post-disaster recovery process. The facets of knowledge that strengthen both the individual and institution learning was highlighted in the research of (Spiekermann et al, 2019). (Ravago et al. 2020) Analyzed the disaster risk reduction and mitigation policies and programs utilized by local governments in the Philippines. Likewise in China, (Liu et al., 2022) investigated disaster resilience in flood prevention and control using index sequence.

Model based research was conducted to examine risk reduction processes , disaster resilience (Liu et al. 2020), ability to understand geographic information (Tomaszewski et al.), and (Ding et al. 2020) developed a new and a greater general framework for disaster management for emergencies. Several studies aim to address problems in disaster management such as (Spiekermann et al, 2019) determination in adjustments in social and functional issues in disaster risk reduction. Gaps in the knowledge management based on construction professionals were identified by (Amaratunga et al. 2018), likewise, (Mohideen & Dorasamy, 2020) action research was conducted to improve the disaster recovery process.

The role of technology in gathering information that were utilized in the different phases of disaster management were significantly indicated in several researches. The main objective of the study of (Leskens, Brugnach, & Hoekstra, 2019) was to assess the use of interactive flood simulation models that could be used in decision-making process. Moreover, in (Miles et al.) simulation approach was utilized to test the Community of Practice in generation and distribution of shared ideas. The study of (Inan, et al 2018) backed the used of Decision Support System that had a single access point in disaster management.

The local and indigenous knowledge as utilized in disaster management had also been the focused of several research reviewed. Obi et al. investigated the indigenous flood control knowledge to helped in risk reduction. On the other hand, the secular discourses practices of development in disaster management was the subject of (Gibb) (table 1).

Table 1. Disaster Management

Author/s	Study Type	Research Objectives	Findings	Type of Disaster	Country in which the disaster occurred
Opdyke et al., 2018	Empirical study	Explore the present state of training and education in post disaster construction of housing, shelter and examined how households utilized their knowledge.	The results showed that household increased their knowledge through formal training that has reflective observation, active participation and on-site observation activities.	Typhoon	Philippines
Obi et al. 2021	Exploratory study	Investigated the indigenous flood control and management knowledge to know the risk reduction effectiveness in Nigeria.	The results indicated that the eight types of indigenous flood control and management knowledge in Nigeria are effectively reduce the risk.	Floods	Nigeria
Ali et al., 2020	Case study	A case study on 2010 flood in Sindh, Pakistan identify knowledge manage as a significant factor in the transition process as a facilitator between relief, rehabilitation and recovery.	There should be a mechanism in the maintenance and distribution of data gathered during the post-disaster recovery process to be utilized for future planning.	Floods	India
Author/s	Study Type	Research Objectives	Findings	Type of Disaster	Country in which the disaster occurred

Kusumastuti et al. 2021	Literature Review	Examine the current literature on knowledge management in terms of the preparedness of the community in natural disasters.	Knowledge transfer and creation in Lombok community increased post 2018 earthquake.	Earthquake	Indonesia
Spiekermann et al. 2019	Empirical Study	In Austria and Mexico, explored the knowledge fragmentation and its causes in the disaster management phases.	Learned the facets of knowledge that strengthens individual and institution learning necessary to determined adjustments in social and functional issues in disaster risk reduction.	All the Natural Disasters	Austria
Pribadi et al. 2021	Empirical Study	Investigated the knowledge on past earthquakes and how it used to promote resilient infrastructure.	The lack of information and knowledge on the resiliency infrastructure performance during earthquakes calls for a need to developed a knowledge management system.	Earthquake	Indonesia
Ravago et al. 2021	Descriptive Study	Analyzed the disaster risk reduction and mitigation policies and programs utilized by local government.	Describes the framework and design that highlights the creation of indices. It also gives information on field operations.	Floods	Philippines
Lee, 2020	Correlational Study	Analyzed the relationship between public officials' expertise on disaster management and their capabilities to collaborate.	Knowledge had positive influence on collaboration among government organizations and the ability to engage in public-private partnership.	All the Natural Disasters	South Korea

3. Methods

Around 46 respondents who experienced the recent July,2022 Abra Earthquake was chosen based on a purposive sampling method. A structured questionnaire was prepared and arranged chronologically which included the respondents' characteristics, activities about knowledge management before the earthquake, response during the earthquake, application of knowledge preparedness during the earthquake. Respondents were brief regarding all the questions included in the survey. Data collected were analyzed using the guidelines issued by the Philippine National Disaster Risk and Resiliency Council with regards to the suggested response during the earthquake. Statistical Package for Social Sciences (SPSS) was used to analyze survey data.

4. Results and Discussion

***Before the Abra July, 2022 earthquake *** P1. Do you have any information about earthquake disaster preparedness before July 2022? (choose only one)
46 responses

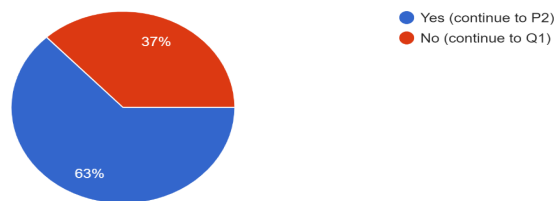- Yes (continue to P2)
- No (continue to Q1)

Figure 1. Earthquake disaster

In the question, having information about earthquake disaster preparedness before an actual earthquake occur 63% of the respondents have knowledge of disaster preparedness and 37% of the respondents have no knowledge of disaster preparedness (Figure 1-6).

P2. If yes, state what sources and information were obtained on disaster preparedness: (options can be more than one)
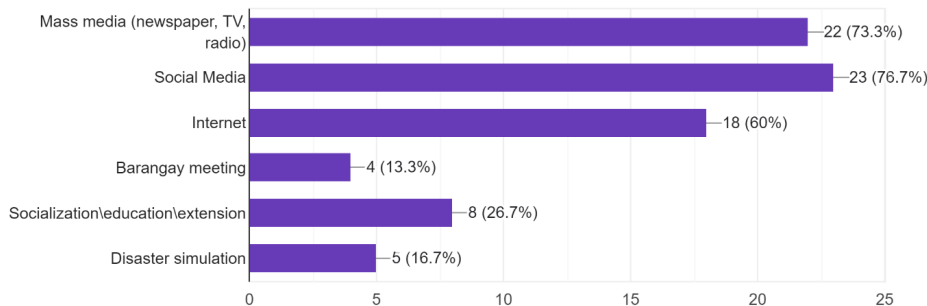30 responses

Figure 2. Information of knowledge management.

Majority of the respondents chose Social Media 76.7% and Mass Media 73.3% as the main sources of information of knowledge management. The Internet was the choice of 60% of the respondents while, barangay meeting was 13.3% choice of the respondents.

P5. After obtaining the information/consultation/extension/simulation mentioned above, I understand about the disaster risks where I live.   1=Strongly Disagree 7=Strongly Agree
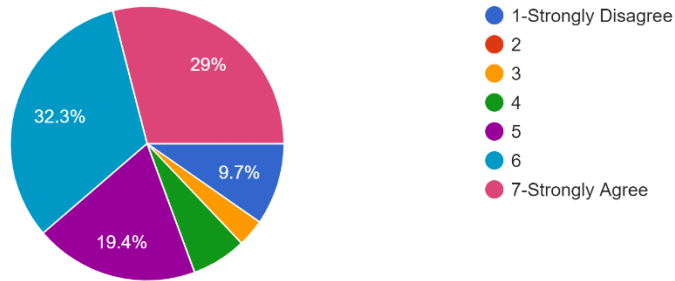31 responses

Figure 3. Disaster Risk

The results show the majority of the respondents strongly agrees that they understand disaster preparedness better through simulation exercises.

During the (Abra) earthquake in, July 2022 Q1. Where were you when the earthquake occurred: (choose only one)
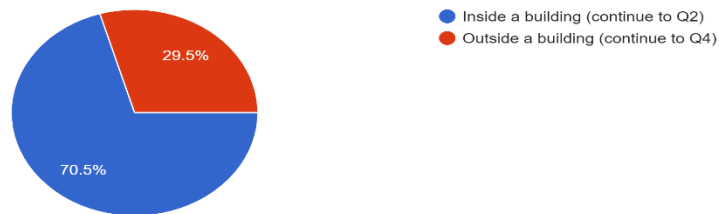44 responses

Figure 4. Earthquake occurred

During the earthquake last July, 2022 70.5% of the respondents were inside the building while 29.5% were outside the building.

Q3. Inside the building: if your action were to protect yourself/your family, what would be done: (options can be more than one)
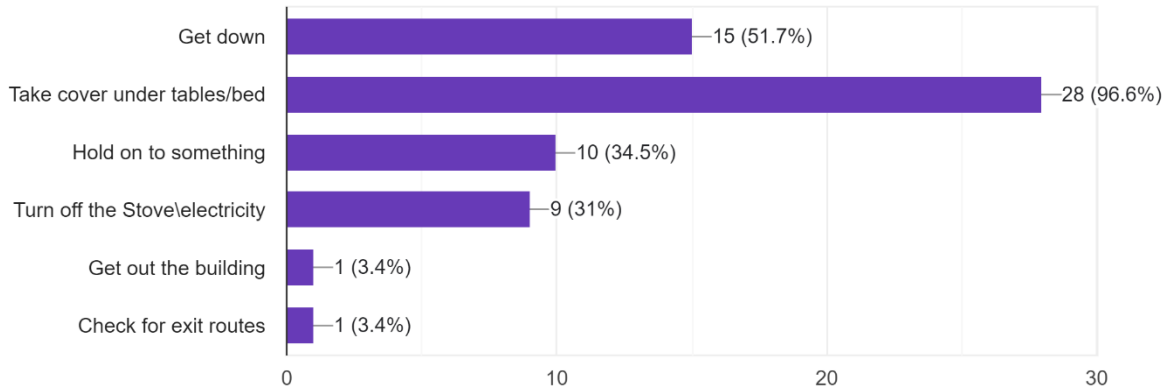
29 responses

Figure 5. Action to protect family

Almost all of the respondents 96.6% choose the "take cover under tables/bed" option and 51.7% choose the option "get down". It affirms the knowledge comes from simulation exercise or earthquake drill conducted by national government, local government and private institutions.

Q5. What did you first do after the earthquake? (choose only one)
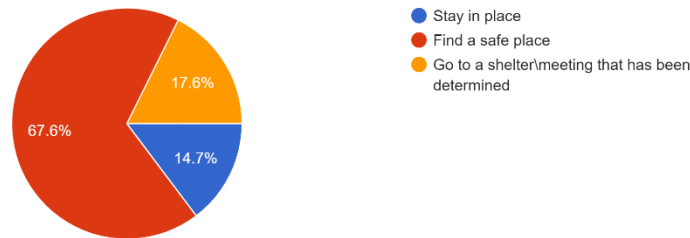
34 responses

Figure 6. What did you first do after the earthquake

Majority of the respondents indicated that the first thing they do after an earthquake is to "find a safe place" with 67.6% of the total 46 respondents. "Go to a shelter's meeting that has been determined" has 17.6% and "stay in place" has 14.7%

The study suggests that the respondents' knowledge about disaster preparedness was applied in disaster response during the actual earthquake. Opdyke 2017, training and education in disaster preparedness should be properly utilized during disaster response. Moreover, the application of knowledge in disaster preparedness increases collaboration in the community (Lee, 2020). The study of (Miles et al, 2020) about simulation approach which was utilized as part of a community practice in the distribution of shared ideas was confirmed by this study through the respondent's response on the use of their knowledge after obtaining through simulation and/or extension activity. Shah et al., 2020 cited that awareness and training programs are necessary. Moreover, (Richmond et. al., 2020) stated that training and support from leaders is essential in disaster preparedness and response. Furthermore, the results that the main source of information are from social media and mass media validates the study of (Leskens, Brugnach & Hoekstra, 2019) that the role of technology in information gathering is a significant source of knowledge.

6. Conclusion

The study aims to explore how individuals and the communities applied their knowledge in disaster preparedness before, during and after disaster. The study illustrates that knowledge management could be utilized by the community before, during and after a major disaster happened. The study shows that the community were able to apply the guidelines set by authorities during training and simulation. The study was able to explore the actual response by the people who experienced the disaster, thus having a better understanding of how people apply their knowledge. However, further improvement in the aspect of knowledge transfer is still necessary to have more participants and to encourage more communities to conduct disaster preparedness training and simulations. Since most of the information came from social media and mass media the use of technology should be adopted.

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Biography

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