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RESEARCH PAPER

Role of Digital Media in Disaster Management: A Case of Khyber Pakhtunkhwa Pakistan

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ABSTRACT

The present study was designed to explore the role of digital media in disaster management of Khyber Pakhtunkhwa (KPK) province of Pakistan. The study aims to examine the reliance of disaster management organizations of KPK on digital media for internal and external communication and also for maintaining archives which were later in used to develop communication strategies. To explore this, qualitative approach was adopted and In-depth interviews were opted as the method of data collection. Data were collected from National Disaster Management Authority (NDMA), the Provincial Disaster Management Authority KPK, the Irrigation Department of KPK, the Pakistan Meteorological Department, Rescue 1122, and two top-notched NGOs trained for natural disasters. NVivo software was used to carry out the analysis, with Thematic analysis. Social Mediated Crisis communication model was used as theoretical support for the study. The present study came up with results that disaster management organizations in KPK are using digital media for communication but they are using existing technologies, i.e., WhatsApp for communication. For early warnings, they rely on Pakistan Meteorological Department (PMD) but PDMA KPK has tried to develop their own simulators for early warnings of flood but that project was at a very early stage. Similarly, they have developed some customized technologies but for limited use and purpose; some are for calculating the damage done by natural disasters, and others for a daily situation report.

KEYWORDS Digital Media, Disaster Communication, Disaster Management, Natural Disaster, NDMA, Pakistan, PDMA

Introduction

Digital media has reshaped communication as speedily incipient, devoid of geographical restrictions and collaborative on both social and individual levels. It's challenging to manage fast communication; this challenge mostly intensified in an emergency situation or at the time of disaster (Rawlins, Martin &Bowen, 2019). If pre-disaster communication between the organization's administration and staff will be done assertively then the situation will generate a resilient and optimistic impression in constructing plans for disaster management (Lim & Kim, 2020). Presently, digital media assists as a potent tool in disaster management and also during the relief process. Jin et al. (2014) examines that at present people use digital media very regularly in their routine life, and this usage increases during the time of disaster. They communicate through digital media to know the conditions in the effective area to seek information regarding food, transport, shelter, medicines, and other needs for survival. In some cases of natural disasters, the other infrastructure of communication got damaged so the only mean of communication to manage the disaster is digital media. Therefore, this medium is not only used by the common public but also by the disaster management organization as it is a safe and fast medium of communication in disasters. Digital media not only provide support in communication but also helps in the relief process of disasters. Many fundraising campaigns are also run on different platforms of digital media (Mendoza, Poblete & Castillo, 2010).

Donna Takada and Oishi (2016) described that operative disaster communication support to generate human safety in the management process of the disaster, and also reduces substantial and somatic loss. Moreover, digital media also transformed the aspect of facts sharing regarding the disaster because digital media substantiated two-way communication. In this regard, through digital media, the stricken people from disaster and disaster management organization communicate on one platform directly, which makes the rehab and recovery process very fast and smooth. In this way, digital media is psychologically empowering the disaster-stricken people, which ultimately help them to overcome disaster suffering (Hussain & Sheikh, 2019). On the other hand, Lai at et. (2020) explained that every society and country has its own patterns for disaster communication and the collection and distribution of disaster information. Kwok et al. (2020) discover the usage and recognition of digital technology in disaster management. The findings show that the present users accommodate the usage of digital technology in disaster management procedures and they recognized that digital technology in disaster management creates the supervision stress-free and outcome sloping. Peoples increasingly use digital media during a disaster, not only the common public but also disaster managers and organization also uses digital media to obtain and share information during the time of disaster (Chauhan & Hughes 2017).

Pakistan is amongst the most disaster-inclined countries in South Asia, which has lost approximately eighteen billion US dollars in damages and reimbursements throughout the past ten years (Khan, 2017). Particularly, in 2019 the environment susceptibility Index classified Pakistan as eighth amongst the ten maximum stricken states; since the life-threatening climate situations between 1998 to 2017 (Eckstein et al. 2019). Regrettably, Pakistan has very limited resources to confront the disaster as Pakistan is a developing nation. Incidentally, managing a disaster requires huge resources and a cogent organizational structure. It's evident that one cannot avoid a disaster but definitely can decrease the harm and regularity of it by handling it speedily and retaining satisfactory procedures (Khan & Khan, 2008). Previously, most of the studies highlight the use and effects of social media and traditional media in disaster communication and management. Hence, the present study aimed to examine the extent of reliance on digital media for disaster communication by disaster management organizations of Khyber Pakhtunkhwa (KPK), and the role of digital media in helping the flow of information; before, during, and after the natural disaster for communication and coordination. In addition to that, it also highlighted; how much digital media is used for maintaining digital archives for developing future disaster communication strategies, also the use of digital media for internal and external communication by disaster management organizations in KPK and their allied federal departments.

Literature Reviews

Disaster Communication

Primarily communication was not a main fragment in managing a disaster but presently it is being acknowledged as an entity of playing crucial role in managing a disaster and its response and rehab phase (Haddow, & Haddow 2014). Communication is pragmatic in all three phases of disaster management; which are preparation, rejoinder and rehab (Houston et al., 2015). Similarly, Coombs (2010) identified them as "the pre-crisis phase, the crisis response and the post-crisis phase" (p.12) Coombs further explains the role of communication in these phases that in first phase purposes is to preclude or formulate, in second phase discourses the disaster, and in third phase disquiets rehabilitation. One of the core objectives for communication in disaster is to upsurge and uphold civic flexibility through concerning and rejoining through the public (Houston, 2015 & Resnyansky, 2014). Which comprises the decrease of ambiguity, and the construction of a logic of individual regulator above the condition (Resnyansky, 2014, & Lin, Sellnow, Spence, & Lachlan, 2016).

Particularly, communication in disaster intentions to preclude or protector the harmful impression of a disaster (Spence et al., 2007).

Disaster Communication and Digital Media

Presently digital media offers excessive gambles intended for disaster communiqué. The use of internet and digital devices has increased and has become the need of hour because of its speed and two-way communication, one can get on spot real time facts and information within no time with these mediums, which ultimately help to manage the disaster effortlessly and quick. (Luna & Pennock, 2018 Coombs, 2010; Williams et al., 2018, & Hallahan, 2010). Digital media permits the comprehensive community to cooperate throughout a disaster concluded a fast huge self-communication (Meer & Verhoeven, 2013, & Hughes & Palen, 2009). Internet and digital devices are demonstrated designate an influential device to consolidate disaster rehabilitation (Hallahan, 2010). Digital media becomes the furthermost operative communication resource among entire world in a very short span of time for disaster management as of its distribution systems' capability and influence to retain commonalities displayed, diverted and captivated. The concentration in digital media initiated several digital organizations to be instinctive, during the intervening time enticing the consideration of the mainstream media (Searson, Soheil, Hancock, & Shepherd, 2015).

Theoretical Framework

The present study uses social-mediated crisis communication (SMCC) model as the theoretical support. The model emphasizes the use of social media to effectively interrelate with all the stakeholders throughout any crises (Austin, Liu, & Jin, 2012). according to the SMCC model, social media is an effective tool to crisis communication as it permits administrations to fast distribute info, quick response, and accomplish the crisis in present time. The method is consisting into three phases: pre-disaster, disaster, and post-disaster, social media help in every phase of disaster in managing and communicating.

The present study also explored; at what extent disaster management organizations have reliance on digital media for disaster communication by keeping in view the disaster management organizations of KPK, and the role of digital media in subsidiary the flow of information before, during, and after the natural disaster for communication. Furthermore, how much digital media is used for maintaining digital archives for developing disaster communication strategies for future. Also, the use of digital media for internal and external communication by disaster management organizations in KPK. Therefore, the SMCC provides the theoretical support for the present study.

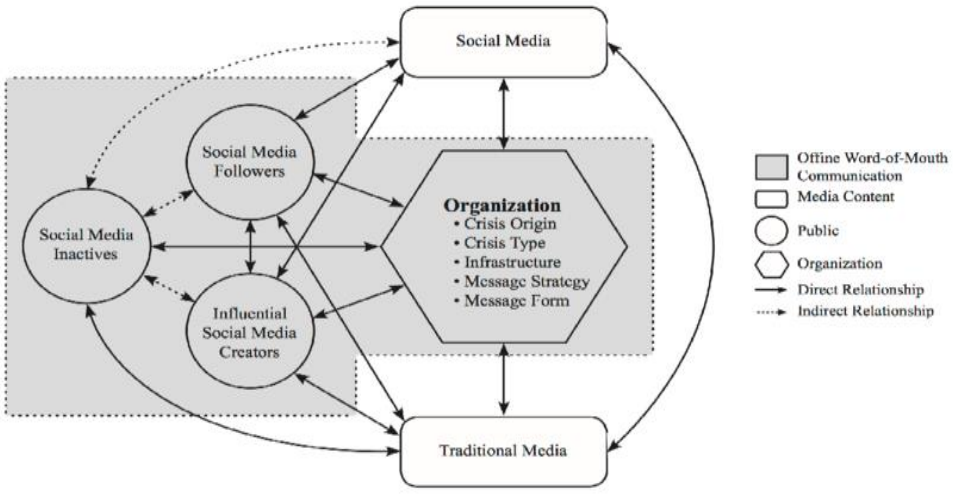


Figure 1 Social-Mediated Crisis Communication Model

Note: From "Strategic Communication: New Agendas in Communication" by Dudo, A. & Kahlor, L. Strategic Communication: New Agendas in Communication, (p. 170), 2017, Routledge.

Material and Methods

The present study adopted qualitative approach to explore the digital media usage patterns for disaster management in KPK. For data collection semi structured in depth interviews was conducted. The sample was comprised of respondents from following disaster management organizations of KPK and Federal allied departments and 2 top NGOs specialized in disaster management.

Table 1
Name and Frequency of Organizations Interviewed

Sr. No	Organization	Frequency
01	National Disaster Management Authority (NDMA)	2
02	Pakistan Meteorological Department (PMD)	2
03	Provincial Disaster Management Authority Khyber Pakhtunkhwa. (PDMA KPK)	2
04	Rescue 1122 KPK	2
05	Irrigation department KPK	2
06	Edhi Foundation	1
07	Pakistan Red Crescent Society	1
	Total Participants for Interviews	12

A sample size of 12 respondents were selected by employing purposive sampling technique which is a type of Non probability sampling. Latest version of NVivo software was used for qualitative data analysis. Thematic analysis was performed by making themes and sub themes of the data.

Results and Discussion

After data collection the interviews were transcribed and thematic analysis was performed by defining themes in the NVivo software.

Themes of the Study

Following are the themes and subthemes of the study:

Use of Digital Media for Internal Communication

a. Use of WhatsApp
b. Use of Telephones
c. Use of Wireless Communication
d. Use of Letters
e. Use of Fax
f. Email
g. Short Message Service (Mobile SMS)

Use of Digital Media for External Communication

a. Use of WhatsApp
b. Use of Telephones
c. Use of Wireless Communication
d. Use of Letters
e. Use of Fax

f. Email
g. Short Message Service (Mobile SMS)

Use of Digital Media for Archives and Communication Strategy

a. Reporting Management System
    i. Daily Situation Report (DSR)
b. Website
    i. Contingency Plans
    ii. Survey

Use of Customized Technology for Disaster Communication and Management

a. Modelling
b. Simulation
    i. Early Flood Warning System
c. Mobile Applications
    i. One Touch
d. Damage Assessment Systems
    i. Flood Relief Compensation Dashboard
e. National Flood Response Coordination Committee
f. Online Portals
    ii. Office Management System
    iii. Reporting Management System

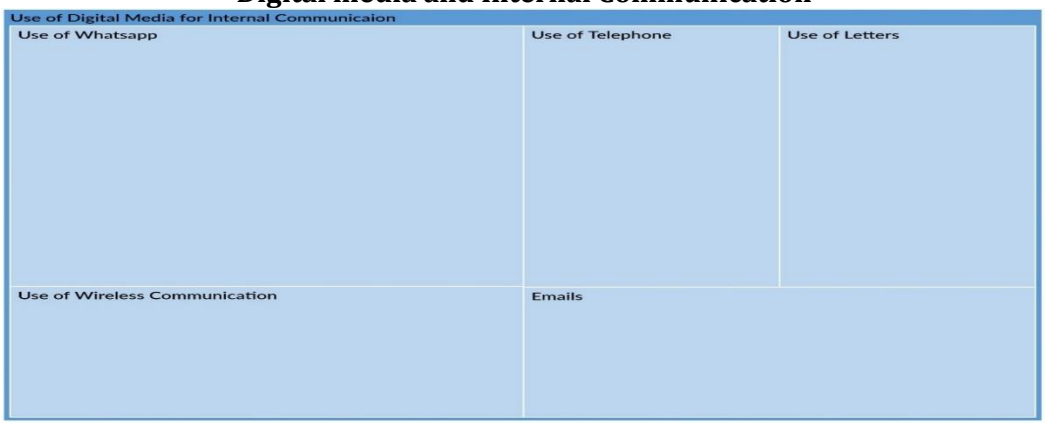
Use of Digital Media and Better Information Flow

a. Helps in Controlling Damage
b. Helps in Reducing Response Time
c. Improve Coordination
d. Provide Opportunity for Two-way communication
e. Timely Information

Use of Digital Media for Internal Communication

The diagram below is showing the use of digital media by KPK disaster management organizations and allied departments of federal disaster management organization about the methods of communication within the organization.

Table 2
Digital media and Internal Communication



There were five different methods of communication which were explored as mediums of Internal communication of an organization for managing disaster in KPK. The size of the diagram shows the amount of discussion on the defined subtheme. Among the five different ways, WhatsApp found to be the most usage method of communication among the disaster management organizations of KPK followed by Wireless communication, emails telephone lines and letters.

One of the respondents stated that: in past letters were the most common method of disseminating information about any disaster or emergency situation but after the advent of digital media the methods of sharing information and communication were changed. WhatsApp has made the life of disaster managers a bit easier and within no time we can share any kind of information to all allied departments either by sharing official letters from PDMA KPK or advisory shared by the Pakistan Meteorological department (PMD).

Use of Digital Media for External Communication

This section is explaining the methods of digital media for communication outside the organization which was represented as external communication.

Table 3
Digital Media and External Communication

In the above diagram six methods of external communication were found as the main areas of discussion which includes Use of wireless communication, WhatsApp, telephone, letters, fax and emails.

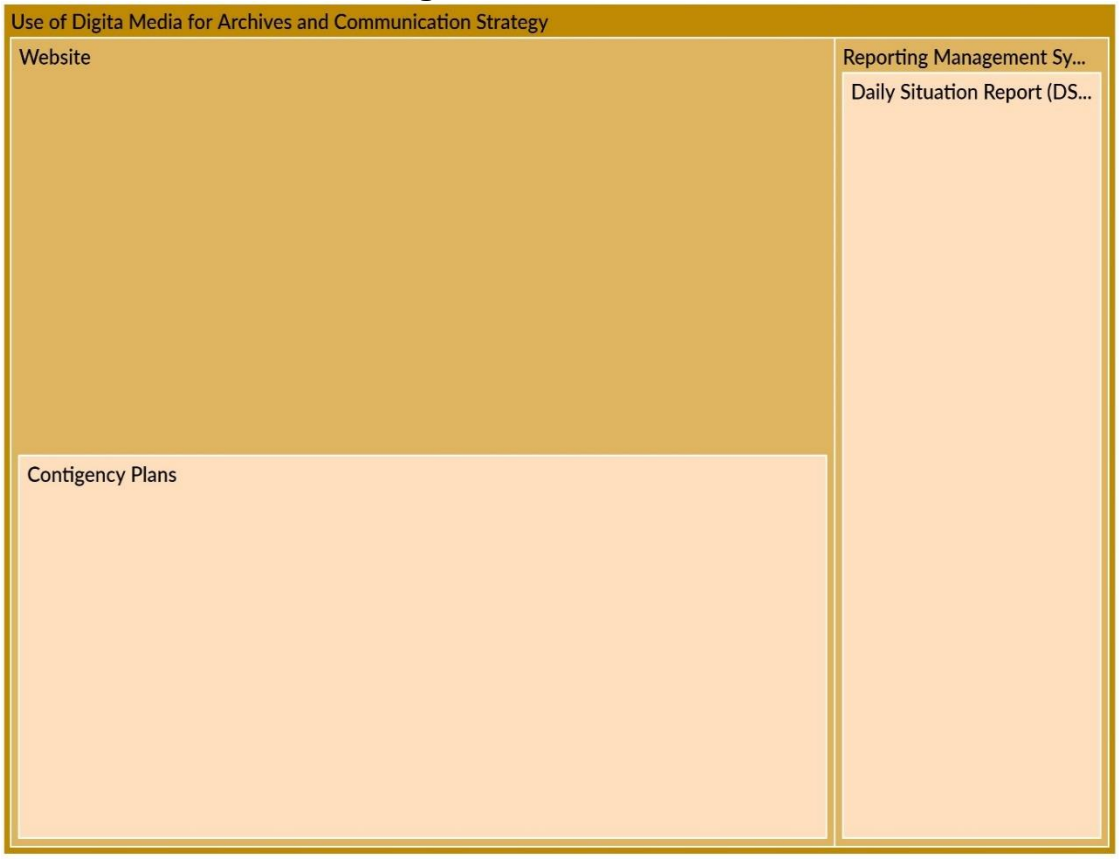
One of the respondents stated that PDMA KPK has established a Provincial Emergency Operation center (PEOC) in which they have focal person from all allied departments involved in disaster management. So, most of the time they were sharing information by using telephone lines and wireless communication for rapid response and

were used to send fax and letters as advisories beforehand and also use WhatsApp for sharing information and official advisory issued by the PMD and then by PDMA KPK.

Use of Digital Media for Archives and Communication Strategy

This part highlights the use of digital media for maintaining archives and used those archival data for developing communication strategies to manage disaster.

Table 4
Digital media and Archives



The above diagram shows Two main digital platforms of maintain archives. One is the website and other is Reporting Management System (RMS). The size of the diagram showing that website is mainly the platform under use for maintaining digital archives.

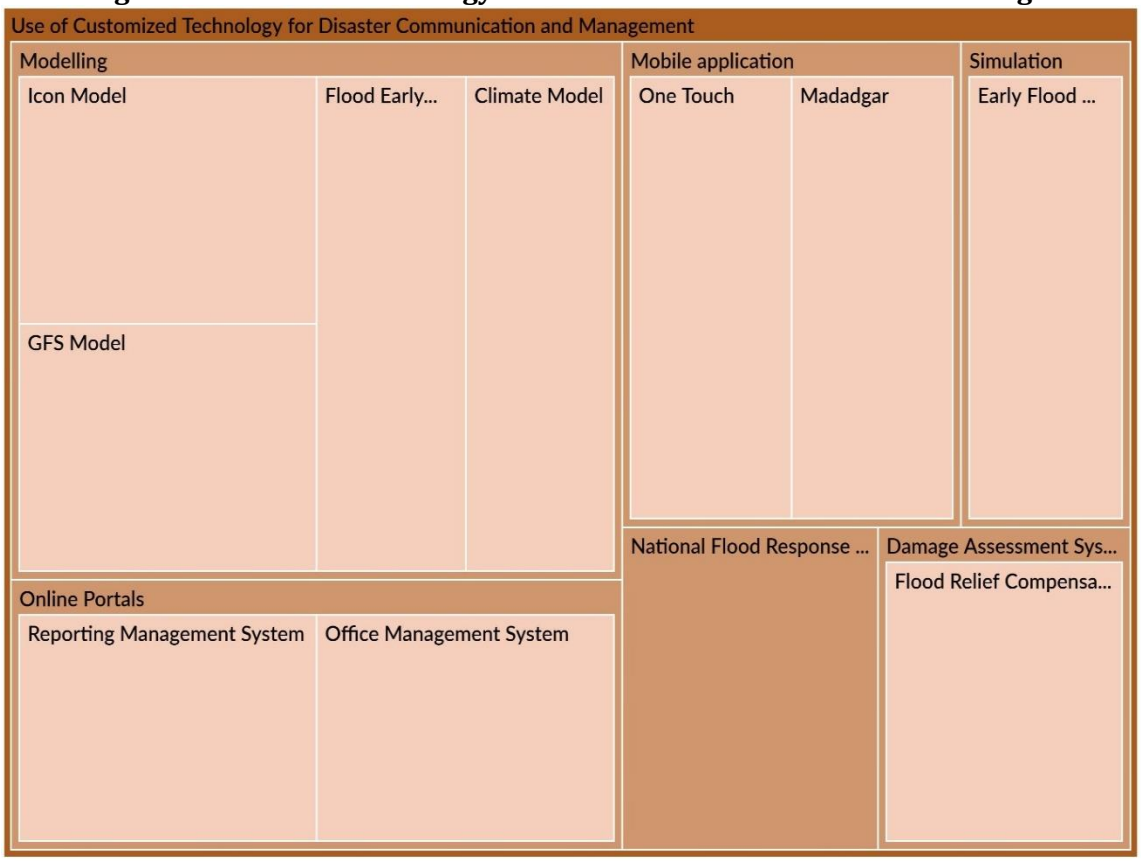
One of the respondent stats that disaster management organizations of KPK used to develop contingency plans and divides these contingency plans in three phases: 1. Monsoon contingency plans, 2. Winter contingency plans, 3. Heat wave contingency plans. These plans were developed with the help of different stake holders and district administrations of KPK in which they shared about the available resources, shortcomings in term of resources or any other special requirement for managing any emergency situations and upload it on website.

Another respondent shared that PDMA KPK is using Reporting Management System (RMS). RMS is like a dashboard system which was operated by Data Communication Assistants who kept on updating the weather reports, the amount of water in dams, rivers and any about any other emergency situation. This RMS helps them to generate Daily Situation Reports (DSR) which gives a summary of the situation on day-to-day basis to keep informed the concerned stake holders to tackle with any disaster beforehand.

Use of Customized Technology for Disaster Communication and Management

In this theme the use of customized technology for disaster communication and management were analyzed.

Table 5
Existing or Customized Technology for Disaster Communication and Management



The above visuals show that disaster management organizations of KPK were using different customized technology for disaster communication and management. There were 5 different platforms, developed for disaster communication and management. These five platforms were: Modelling, Online Portals, Simulations, Mobile Application and Damage Assessment Systems.

The size of the diagram shows the amount of discussion on specific kind of software or technology. Modelling is the most commonly used technology specifically used by Pakistan Meteorological Department (PMD) for early warnings of different kind and range of disasters. Like Climate Model, Icon Model, GFS Model and Flood Early Warning System (FEWS) Model.

Second largest box is about the online portals which includes Reporting Management System (RMS) by PDMA KPK and office management system by NDMA for organizational communication management purpose.

Third type of customized technology includes Damage Assessment Systems which were used in the third phase (Recovery) of disaster management for damage assessment and loss calculations for disaster victims. The systems include Flood Relief Compensation Dashboard by PDMA KPK for the compensation of flood affected victims for their lose and damage

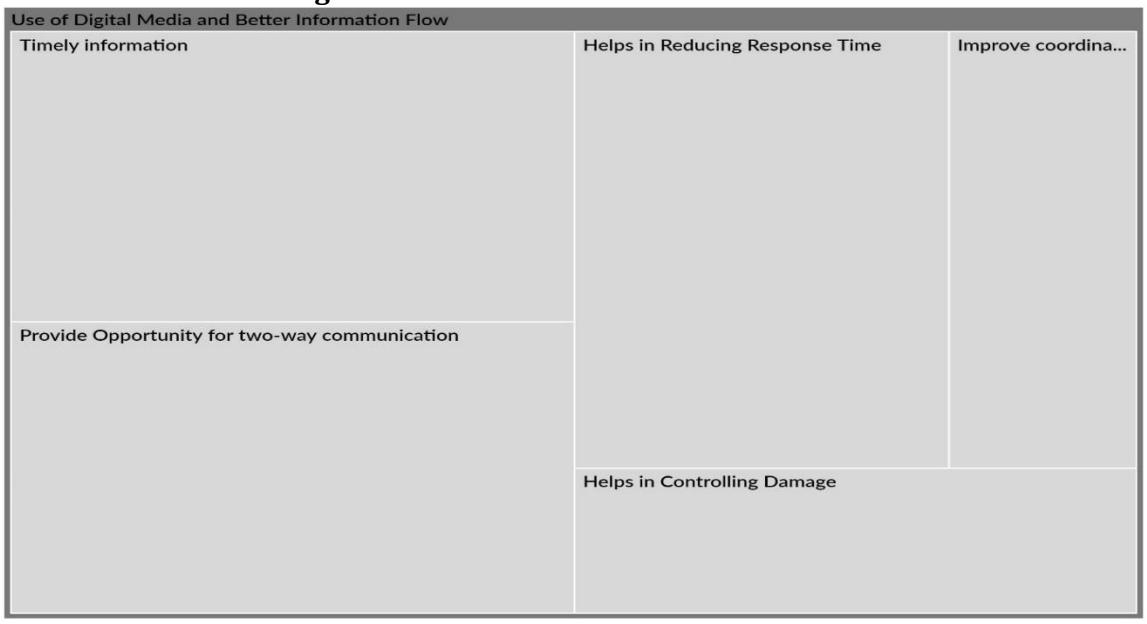
Mobile Application also sharing the large part of discussion which means that disaster management organizations in KPK were relying on mobile applications for disaster communication and management. Two applications were most commonly in use. One is with the name of "One Touch" and the second one is "Madadgar" which aids PDMA KPK and common public to share any emergency or disaster situation. Another kind of technology used by PDMA KPK was Simulators named as Early Flood Warning System.

National Flood Response Coordination Committee developed by NDMA for flood response coordination. Followed by the Damage Assessment System which includes Flood Relief Compensation Dashboard for helping the flood affected victims to compensate their loss.

Use of Digital Media and Better Information Flow

Communication is key in managing disaster and the innovative inclusions in the digital technology has made this process easier than ever before. In this theme the present study is analyzing the use of digital media for better information flow in all the phases of disaster.

Table 6
Digital Media and Better Information Flow



The above diagram shows five major points agreed by the disaster management organizations in KPK. The largest size of box in the above diagram is showing that most of the respondents are of the view that digital media is strengthening disaster managers in providing timely information. Second largest part showcasing the opportunity provided by digital media in terms helping in two-way communication.

Third large box representing the aid provided by digital media in reducing the response time for any disaster. Fourthly respondents are of the view that use of digital media helps in controlling the damage.

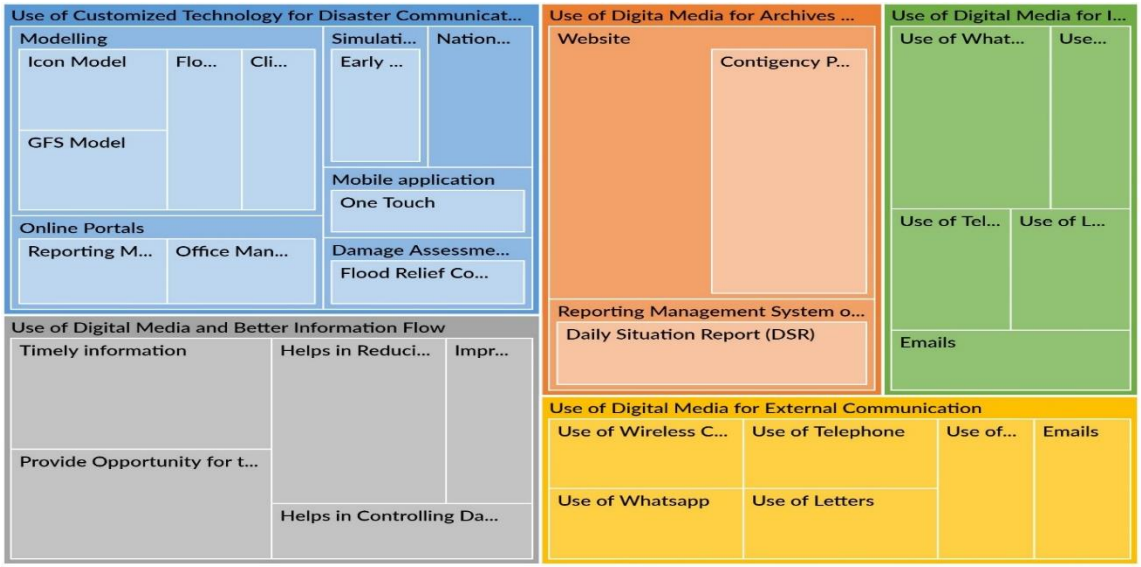
One of the respondents stated that:

It helps us in reducing our response time and when we compare the flood of 2010 and 2022 the intensity was the same but in 2022 the timely information, we received from our system helps us in reducing the amount of damage as compare to 2010.

Lastly use if digital media helps in improving coordination among the disaster management organizations because these digital platforms have special features which make the coordination more efficient.

Collective Result of Themes

Table 7
Collective Results



Word Cloud

One of the features that NVivo provides is the option of word cloud that shows the concentration of the words used during the data collection. Word Cloud shows the extensive use of the keywords for instance, communication, KPK, PDMA, disaster, emergency, rescue 1122, contingency, information management etc.

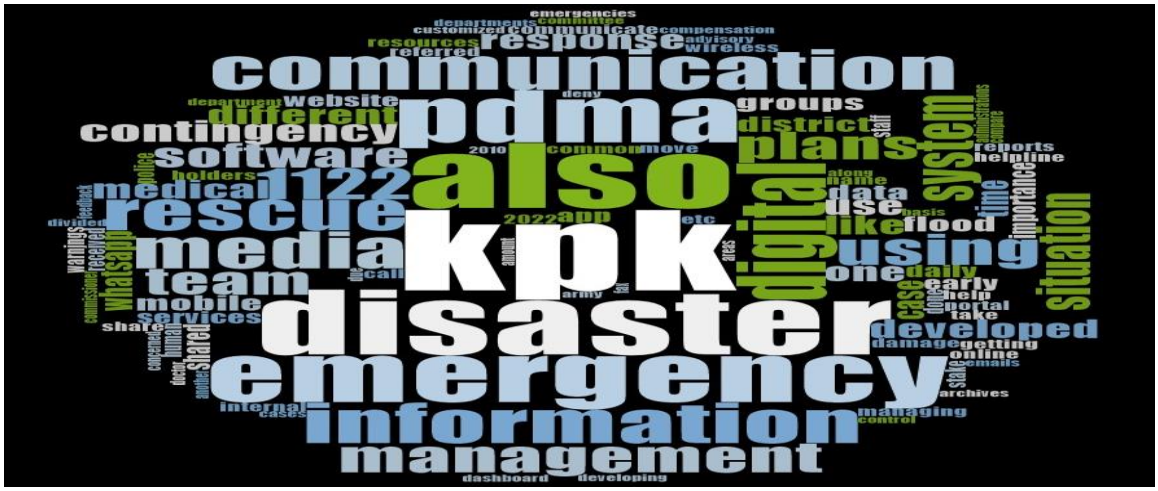


Figure 2 Word Cloud

Discussion

Research question 1 explored the popular forms of digital media used by disaster management organizations of KPK along with National Disaster Management Authority (NDMA) and Pakistan Meteorological Department (PMD) with in their organization and outside the organization for communication and coordination in managing disaster. Considerable literature has found on the use of social and digital media for disaster

communication and management. Presently, digital media offers excessive gambles intended for disaster communication. The use of internet and digital devices has increased and has become the need of hour because one can get on spot real time facts and information within no time with these mediums, which ultimately help to manage the disaster amicably. (Luna & Pennock, 2018 Coombs, 2010; Williams et al., 2018, & Hallahan, 2010). Findings of the study (see table 1 & 2) shows that disaster management organizations in KPK are using both conventional and digital platform for communication and coordination. These platforms include, forms of communication explored during data collection, WhatsApp has found to be most usable platform for communication in all major phases of disaster (before, during and after). Respondents are of the view that in past time letters and fax were the most common forms of communication but with the advent of WhatsApp our communication has been revamped. It has become easy and manageable. We have made WhatsApp groups with higher management to the field staff along with all stakeholder departments. Now we can receive information in no time by using these digital platforms. These disaster management organizations are still issuing letters as official standings of any advisory or orders but these letters were also circulated through WhatsApp.

Research question 2 aimed at exploring the use of digital media for maintaining archives for developing disaster communication and management strategies. Archives in disaster management organizations are very helpful as they help them to formulate disaster communication and management strategies. Ifijeh at el. (2016) explored that digital archives on ICTs are very important in the disaster management process. Because it's the safest way to maintain archives and easy to access them at the time of need. They are more important in the rehab process as they guide the damage and also help in making future plans. Similarly, Gerster at el. (2022) explore the role disaster digital archives in disaster education, by using Japan disasters digital archive (JDA), the study shows that disaster digital archives play an important role in educating people regarding disasters and its prevention, it also explored that these archives also help in making rehab and future plan regarding disaster management. Findings of the study (see table 3) shows that KPK disaster management organization are using two main digital tools for maintaining archives. One is their website and second is their dashboard system named as Reporting Management System (RMS). Disaster management organizations developed their contingency plans for three major seasons which includes, Monsoon, Winter and Heatwave contingency plans and upload them on their website. Secondly, they are using RMS which helps them in compiling information on regular basis and generates Daily Situation Report (DSR) which helps disaster management organizations to keep a close eye on any of the natural disaster situation or emergency. Findings show that out of above discussed two digital tools website was the most used tool for maintaining archives. Respondents are of the view on the basis of previous and current year contingency plans (available on website with yearly classification) disaster managers plan their strategies for managing any natural hazards.

Research question 3 explored the use of customized technology for disaster communication and management by KPK disaster management organizations. The dawn of technology revolutionized that different aspects of human life and made it easier for professionals to find solutions of their problems. It is of extreme important that customized use of technology can help disaster management organizations to manage disasters in efficient way. Kwok et al. (2020) suggested that if disaster management organizations setup a customize digital setup for disaster management that will give more efficient results and make the process faster and stress-free. The findings of the study (see table 4) show that disaster management organizations in KPK were using different customized technologies for disaster communication and management which were Modelling, Online Portals, Simulations, Mobile Applications, and Damage Assessment Systems. Modeling is the technology used for the early warning and mapping of any natural disaster especially floods mostly by PMD. Simulation is another feather in the cap of PDMA KPK which helps in detecting early flood warnings. Modeling and simulation were used in the first phase (before) the disaster. Online portals include Reporting Management System (RMS) and

Office Management System (OMS) for compiling data coming from different sources and of different nature. Online portals provide help in all phases of disaster (before, during and after) but mostly in phase 1. Another customized technology was the Flood Relief Compensation Dashboard which was developed for the relief purpose of disaster victims and calculating the due compensation from the authorities for helping them in the rehab process. This flood relief dashboard works in phase 3 (After) of the disaster. Mobile Applications were also developed for disaster communication and management with the name of "One Touch" and "Madadgar".

Research question 4 aimed at exploring the facilitation provided by digital media in making efficient communication flow. Communication is key in managing disaster. Evolution in the field of technology has made this process easier. Previous Studies shows considerable rise in use of digital media platform for disaster management and communication. Chauhan and Hughes (2017) during any disaster, both disaster managers and organization and common public uses digital media for share and obtain information. Liu et al. (2016) finds out that flow of information on digital media is smooth, it becomes an important source of on ground fact and information during disaster. The use of internet and digital devices has increased and has become the need of hour because of its speed and two-way communication. (Luna & Pennock, 2018 Coombs, 2010; Williams et al., 2018, & Hallahan, 2010). Findings of the study shows (see table 5) digital media has provided great facilitation to disaster managers in multiple ways. Digital media platforms provide timely information related to any emergency situation. A very important feature of these tools in promoting two-way communication process. Now you can send and receive information at the same time with exact situation and severity of the disaster. Findings also highlighted that digital media helps in reducing response time to any disaster and also improves coordination among disaster management organizations.

Conclusion

The present study extracted the results that the usage of digital media in managing disaster is evident in countries like Pakistan; where resources are insufficient and organizations need accuracy in their management. On other hand, it is rated amongst the top in the list of most risk-stricken countries. In this regard, Findings of the study show that disaster management organization are using digital media for internal and external communication but still relying on traditional methods. For this, WhatsApp was the most commonly used digital platform for communication because of the ease and advance features it provides in day-to-day communication. Moreover, disaster managers do recognize the importance of archives and their role in formulating disaster communication strategy. They are using website and their dashboard systems to maintain those archives. Findings also reveal that disaster management organizations in KPK are using different customized technology for disaster communication and management like Modelling and Early Flood Warning system (Simulations) for early mapping and warning alerts, Reporting Management System for generating daily situation report and for archives, mobile applications like "One Touch" and "Madadgar" which was for the use of both public and disaster managers. Despite of using these digital media tools disaster management organizations need to focus more on digital tools in line with the other developed states to cope with the emerging threat of climate change in Pakistan.

Implication and Future Direction

The present study explored the importance of digital media in disaster communication, so the policy makers and disaster management organizations of KPK can take help form this study to identify the problems in disaster communication and how digital media can overcome those problems, as this is a disaster-prone region therefore needed urgent and immediate steps to rectify these issues.

As a future direction a cross provincial comparison is needed to explore the issues and plan of action of different provinces of Pakistan related disaster management. A plan to develop a digital communication model for disaster management in Pakistan. Moreover, research can be conducted on different natural disaster as case study to find out the lacking in disaster communication and management and developing concrete communication and management model which helps in reducing the damage and intensity of natural disasters.

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