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IT Applications:
A Way Forward to Improve the Efficiency of Crisis Response Management Against Natural Crises

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ABSTRACT

The IT revolution is transforming the world. These applications are providing new ways of managing organizations. The study was conducted on the employees of Natural Disaster Management Authority (NDMA) of Pakistan. Electronic gadgets like internet, mobile phones, cloud computing, unmanned vehicles are some application of IT that have positively impacted the efficiency of organizations against natural crises like earthquakes, floods, and viral diseases. The study has revealed that these applications have improved the response to the crisis. Moreover, the performance of the organization improved. Outcomes of the study show that through internet and social media platforms, information spreads quickly, which helps to minimize the effect of the crisis. Communication devices like cell phones help the public to communicate to deliver information to the rescue departments. Disaster management departments are also collaborating and sharing experiences with each other using IT applications.

KEYWORDS

Cloud Computing, Crisis Response Management, GIS and Remotes, IT Applications, Mobile Phones and Internet, Print Media, Social Media, Unmanned Arial Vehicles

INTRODUCTION

Crisis management is the use of techniques to assist an organization in dealing with a sudden and severe bad occurrence. A crisis might appear as a result of an unexpected occurrence or as an unanticipated consequence of an event that was previously identified as a possible danger. A crisis, according to academics and managers, is a key occurrence or a moment of action that, if not managed appropriately and quickly, can evolve into a disaster or catastrophe (Desai et al., 2020). These crises have occurred around the world at various times. The severity of the crisis is determined by the country's geographic and industrial scale. Different geographical areas are experiencing various types of crises. Nations near the sea must prepare for crisis scenarios such as typhoons, tsunamis, and other natural disasters that do not threaten the Mediterranean countries. Each country's goal is to safeguard its citizens by utilizing all available resources (Christensen, Dube, Haushofer, Siddiqi, & Voors, 2020).

Each government has a developed disaster management department that is actively engaged in forecasting and managing the crisis. This department uses its expertise, history, and technology to respond swiftly and minimize the effect of a disaster (Su, Gilbert, & Youngquist, 2020). Every

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country's disaster management department works to prevent or eliminate possible losses from disasters. Natural calamities such as floods, earthquakes, and viral diseases may have a major, and often life-threatening, influence on the people. It has the potential to devastate people's economic and social lives. It has an influence not just on humans, but also on animals and infrastructure. Aspects of the afflicted areas (population, buildings, infrastructure, etc.). As a result, anticipating the hazard event and improving people's and property's resilience greatly decreases the negative impact of the hazard. It is critical to respond to disasters and manage such crises. Internet, mobile phones, cloud computing, social media, print media, unmanned aerial vehicles, and GIS and remotes are some information technology (IT) applications used for natural disaster management and response (Lin et al., 2020).

The advancement of technology and new information technology (IT) techniques has created new options for crisis management. Information technology is playing a role in making the crisis response process simple and rapid. Information technology refers to the application of technology in many sectors, such as business or other organizations, to address little or large issues at various levels. Many companies rely on their IT departments to keep things functioning. Things are becoming faster and easier with the aid of IT (Choi & Yeom, 2019). IT has now developed automated solutions that require very little human intervention to function. According to Andrey Prokopchuk, head of IT at Belitsoft, the ideal IT department is one that you aren't even aware of. It indicates a good IT department does not need to operate manually. It should be so automated that no one is aware of it, and it should continue to function automatically. The ideal IT department is always in sync with the organization's vision and goals. It is made up of three fundamental pillars: IT governance, IT operation, and hardware & infrastructure. IT is currently being used in every sector thanks to various gadgets and apps (Pahi, Hamid, & Khalid, 2016).

In Pakistan, the disaster management department is also functional but facing many challenges. Since 2005 when the crisis rises due to the earthquake more than 73,000 people died and it damaged the infrastructure a lot. The urgency and importance to address Disaster Risk Management (DRM) holistically were further highlighted in the aftermath of the unprecedented 2010 floods, which affected over 20 million people and almost 20% of the total landmass of the country. Than flood of 2014 has also impacted the economy a lot. During these crises, it has been observed that the impact of the crisis has continuously been reduced from the previous such events (Walumbwa, Hsu, Wu, Misati, & Christensen-Salem, 2019). It was due to the improved management system each time and quick response of the department that before. COVID-19 has also created the largest crisis of the decade. It has impacted the whole world. It was started in China but the country was able to rescue the pandemic due to the fast response system and use of technology to find out the cause and resolve the issue in time (Dinçer, Yüksel, & Çetiner, 2019). (Sirait & Rokhim, 2019). In this situation IT has played its role, the internet was the base of connection and information. Similarly, Mobile phones are the application of IT which is now a day's very common and necessary item for everyone. It helps in such situations to connect to share experiences and real-time information (Sari, Bahari, & Hamat, 2016).

Cloud computing, or just Cloud, is a delivery model in which IT resources and information are provided on demand from locations accessible via Internet. It made easy to get the data available from the internet for use at the same time for each user. It helps to make the processes fast and increase the efficiency to work with billions of people at the same time without any disturbance. All types of social media like YouTube, email, Facebook, and WhatsApp are also the application of IT. People interact, discuss and share information. It promotes creativity and different plans are share with each other. Information sharing and mutual discussion on different ideas make the way better for the management of events. Social media helps to make people aware of the crisis. Information is delivered to make them educated. As derived from a report that a very less loss was faced by the crisis where people were aware and educated about the precautions (Frankenhaeuser, 1991).

Print media also helps to deliver information and create awareness. Print media is developing with the development of IT. The process of print media has become so fast and easy. Unmanned aerial vehicles are the form of drones that are driven with the use of technology without any driver inside.

These drones can reach such places where the human and machinery with the driver is impossible to reach. To survey the places in disaster and to get the footage drones are sent to dangerous and far-off places. From the above discussion, it can be concluded that IT in the different forms of application is always helpful for crisis management and quick responsive to the crisis (Qureshi et al., 2013).

There have been many studies conducted in the field of information technology and business management. Most of the studies have shown that IT has improved the efficiency of management. In a study conducted in China has shown IT as the key tool for the existence of business in the recent era (Marston, Brown, Rainey-Smith, & Peiffer, 2019; Prasad, Vaidya, & Anil Kumar, 2015). There is a lot of work on the IT application but their usage and impacts on the crisis management of natural disasters are very limited. Focus of the study is to find the impacts of IT application on the efficiency of the management and response team against the natural crises that happen due to the disasters.

LITERATURE REVIEW

Information technologies (ITs) play an important role in catastrophe protection, management, relief, and rehabilitation. Government agencies and other non-governmental organizations participating in relief operations and decision-making procedures require adequate, reliable, and effective information. Earthquakes, storms, floods, landslides, droughts, tsunamis, volcanic activity, and wildfires are examples of natural dangers. For all disasters that occur as a result of natural catastrophes, IT plays a key role in supporting the rapid transfer of essential information. To mitigate the devastating consequences of hazards, IT encourages the use of various information and communication technologies and networks, such as satellite, radio, mobile networks, and the Internet, which can help to increase capacity and reduce people's susceptibility (Qureshi et al., 2013).

The broad range of technology is utilized in all four stages of disaster management procss, mitigation, response, and recovery. Remote sensing, Geographical Information System, Global Positioning System (GPS), Satellite navigation system, Satellite communication, Amateur and community radio, television and radio broadcasting, telephone and fax, Cellular phones, video Conferencing Networking Technologies, Internet, e-mail; Online management databases, disaster information systems and networks, Robotics are some of the technologies that are used (Qureshi et al., 2013).

INTERNET AND EFFICIENCY OF CRISIS RESPONSE MANAGEMENT

Information technology is currently employed in many aspects of life. The Internet is also application of information technology. The Internet is regarded the technological foundation. As the world's marketplaces increase, so does rivalry among governments and enterprises. The world is becoming a global market. The internet serves as a conduit for communication from far-flung locations. The Internet is a worldwide network that connects billions of computers and other electronic devices (Aruddy, Achsani, Wijayanto, & Sartono, 2019; Asngari, Marwa, Susetyo, Suhel, & Kadir, 2018). It establishes link between individuals and organizations. It is regarded as the greatest innovation ever devised by mankind. In the form of IOTs devices, industries are employing for automation, monitoring, and management. Many academics have conducted studies on the internet and industry management. The functionality of the industrial internet of things has demonstrated that the internet improves organizational management efficiency. Their research suggests that the availability of the internet may give organizations oversight from a single room and can make processes automated and quick. The internet and engineering services (Hussain, Rizwan, Nawaz, & ul Hameed, 2013). Previous studies revealed that the internet factor is a key factor for IT applications rather than All IT applications like GIS and remotes, unmanned Arial vehicles, and social media. Based on the above discussion, a Hypothesis is developed which is given below:

H1: Use of Internet has a positive significant impact on efficiency of Crisis Response Management

MOBILE PHONES AND EFFICIENCY OF CRISIS RESPONSE MANAGEMENT

Because a mobile phone is merely a cellular system, it may be utilized over a broad region without the need for a physical network. It is a wireless portable gadget that may be used anywhere. According to studies, mobile phones or cellular phones aid in disasters or other sorts of crises. Mobile phones are component of the disaster assistance system. When a natural calamity strikes, people's natural and amazing instinct is to take up their phones and communicate with their family and friends. In the event of a crisis, individuals utilize mobile phone technology to contact emergency help agencies such as the fire department, police, army, and ambulance, and only for urgent calls (Chiu, Chien, Lin, & Yun Hsiao, 2005). Relief agencies use mobile phone services to communicate with individuals in need of assistance, most notably after earthquakes. Previous research has also suggested that mobile phones have a positive and significant influence on the performance of crisis response management by serving as a means of communication. These telephones are also useful for making donations by just clicking on certain applications. Individuals who wish to support the agency by donating money also utilized their cell phones. New developing apps and systems aid in the delivery of donations to appropriate authorities. Mobile phones were useful in looking for and locating persons by utilizing their phone's location. Previous studies revealed that mobile phones are helpful for crisis response management (DeTienne, Agle, Phillips, & Ingerson, 2012). Based on the above discussion, the following hypothesis is developed:

H2: Use of Mobile phone has positive significant impact on the efficiency of crisis response management.

CLOUD COMPUTING, CRISIS RESPONSE AND MANAGEMENT

Due to change in weather patterns and soil corrosion natural disasters come without any warning and take lives of tens, hundreds and thousands. Natural crises cause severe types of damages and it takes a longer time to recover. Damages from natural crises continue after it in the shape of sickness, diseases, and economic downfall. For resolving these types of issues, many IT applications are being used, one of the forms is cloud computing (Samsinar, Hamid, & Rasyid, 2019).

Cloud computing is an integrated system that incorporates various on-demand resources such as the internet, network, storage, and applications. Previous research has indicated that cloud computing is set to disrupt the whole traditional catastrophe risk management and response system. Cloud computing has proven to be the most effective application of information technology for disaster management. In the event of a disaster, cloud computing is utilized to build an effective reaction management system. Cloud computing improves the efficiency and efficacy of reaction management systems by allowing agencies and concerned authorities to share information and communicate with one another. Cloud computing used as the new emerging technologies in disaster response and management overcome the problems faced in traditional response and management systems by providing timely and accurate information about the affected area and severity of crisis (Tulangow, Saerang, & Rumokoy, 2018). On the grounds of the above discussion, the following hypothesis is formulated:

H3: Use of Cloud Computing has a positive significant impact on the efficiency of crisis response management

MEDIA AND EFFICIENCY OF CRISIS RESPONSE MANAGEMENT

Disasters are both natural and manmade. Media that is social like Facebook, YouTube Instagram or other is print media that is a print form of news. Both media are helpful in a warning for natural

disasters. Studies revealed that print media like newspapers are still considered as the trusted source of information. It has been observed that these media like social and print media give two types of major benefits in case of disasters, one benefit is to give education and warning about the hazards and natural disasters, transmitting information about affected areas, giving official government alerts, and giving discussion about the disaster response (Atkinson & Brander Brown, 2001). The second advantage of this media is communication. Media provides the possibility of timely accurate and sensitive communication, cost-effective means saving lives, and increase public understanding. Previous studies also revealed that these communications with media, warn, educate and inform the people from hazards. From this media news, people take several steps for protecting themselves in times of hazards (Altaf, Hameed, Nadeem, & Arfan, 2019). Based on the above discussion, the following hypotheses are formulated:

H4: Use of Social Media has a positive significant impact on efficiency of crisis response management.
H5: Use of Print Media has a positive significant impact on efficiency of crisis response management.

UNMANNED ARIAL VEHICLE AND EFFICIENCY OF CRISIS RESPONSE MANAGEMENT

An unmanned Arial vehicle is simply called, an aircraft without the human pilot and controlled with the remotes or computers. This Unmanned Arial vehicle is helpful to tackle the most challenging issue for humans which is natural and manmade disasters. Studies revealed that this Unmanned Arial vehicle is helpful in different stages of managing and responding the natural crisis. It provides real-time images of disaster-affected areas and even in those areas which are inaccessible for humans. This Unmanned Arial vehicle helps identify the areas which are affected by natural disasters (An, 2019; Banker, Konstans, & Mashruwala, 2000).

Studies have shown that Unmanned Arial vehicle provides the fastest images and helpful in mapping the affected areas in short time with high-resolution images. This fastest images mapping, immediate the aid and help from managing authorities. Studies also revealed that natural disasters mitigation is an important topic for academia and industry. For handling this natural crisis and disasters, time is an important factor. This Unmanned Arial vehicle is important in managing the severity of the crisis and managing it because this system responds timely and gives feedback in case of high-resolution images which are helpful in crisis response and management. Studies found that this Unmanned Arial vehicle effectively responds and mitigates the issues that were in traditional disaster management like shortage of logistics, human staff, and low bandwidth communication satellite (Nadeem, Alvi, & Iqbal, 2018). Based on the above discussion, the following hypothesis is formulated:

H6: Use of Unnamed Arial Vehicle has a positive significant impact on efficiency of crisis response management.

GEOGRAPHIC INFORMATION SYSTEM OR REMOTES AND EFFICIENCY OF CRISIS RESPONSE MANAGEMENT

Geographic information system and remote sensing is a very helpful and effective way to manage the crisis or disasters. Simply GIS or geographic information system is the database used to manage, store analyze and capture the geographical areas. In case of disasters and crisis response stage, GIS manage the huge volume of data that is used for later assessment purpose. Previous studies revealed that GIS in combination with GPS is a very effective tool to search and rescue the area affected by the natural disaster. Studies have shown that GIS is commonly known as the key support tool in case of natural and manmade disasters. Geographic information System is very helpful in hazard zone

areas for mapping and tracking real-time images which helps to manage and respond the disasters and crises (Tallon, Queiroz, Coltman, & Sharma, 2019). This real-time data and images help to allocate the aid and resources for managing the crisis.

Studies also revealed that remote sensing is a helpful tool in managing the GIS for natural disasters. In GIS, remote sensor sense fastly since the severity of disaster or hazards like (due to, earthquakes, landslides, flooding, forest fires, cyclones, and other disasters) and automatically update the data which is stored in the geographical information system database. Previous studies revealed that Geographical Information Systems and remote sensing map the new area, and effective tools for reconstruction and assist to prevent that this type of hazards or disasters (Yousefi et al., 2019). Based on the above discussion, the following hypothesis is formulated:

H7: Use of GIS and Remote have a positive significant impacts on efficiency of crisis response management.

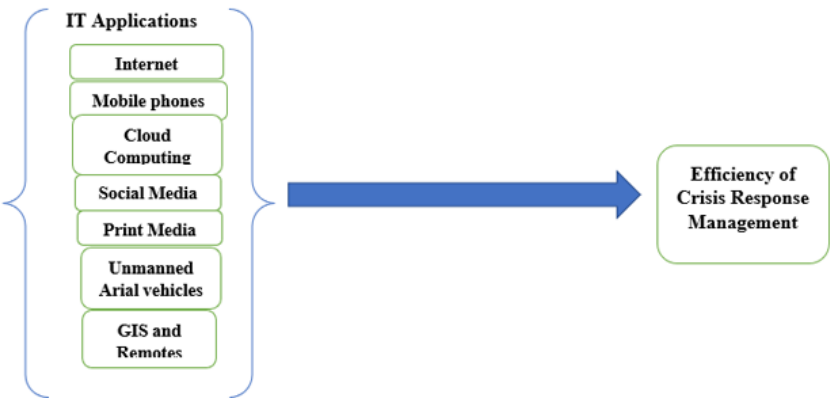
METHODOLOGY

The methodology is considered an essential part of the research document. This part of the research describes important factors related to the population, sample, data collection technique, sampling technique, and statistical tool. Empirical method is used in the article to accomplish the results. To satisfy the objectives of this article, quantitative research was held. The main characteristic of quantitative research is that it is most appropriate for samples, while its outcomes are measurable and quantifiable.

Employees who working in national crisis or disaster management companies or entities of Pakistan and other linked departments were considered as a unit of analysis. Survey method was applied to collect the primary data from the respondents.

On the vile of allusion from Comrey and Lee (1992), 300 sample size is good. Permitting by him "sample that is less from 50 participants will be supposed as weaker size; sample that is less from 100 participants will be supposed as weak size; sample that is less from 200 participants will be supposed as satisfactory; sample that is less from 300 participants will be supposed as good; sample that is less from 500 participants will be supposed as very good while 1000 supposed as outstanding". For the data, the collection dropdown method was used. The author visited the respondents' place for filling out the questionnaire. It is difficult to obtain data from the NDMA in all provinces of Pakistan since other departments are associated with the NDMA and play an important role in disaster management. Data is collected from NDMA is the very first time for this study.

Figure 1. The research Model shows the association among the Use of IT Applications and Efficiency of Crisis Response Management



In 2019, an earthquake happened in Mirpur, Azad, and Jammu Kashmir that killed around 20 people, and 300 got injured. At that time a team of 500 people consisting of NDMA staff, army, police, rescue, firefighters, and other volunteers visited to help affected families. One evening author visited that team to serve them food. There author also requested them to fill questionnaire for study, they corporate accordingly.

Questionnaire items were administrated on 5 points Likert scale. The questionnaire was based on two major parts, one portion was related to demographics and the other includes the items related to the study. These items are according to variables adapted from previous studies (Williams & Phillips, 2014). From a total of 350 distributed questionnaires, 180 were returned. The questionnaire that was incomplete and have outliers was excluded from the survey. Therefore, a total of 170 questionnaires were used in data analysis.

DATA ANALYSIS

For analysis of collected data Smart PLS was used as a statistical tool. First of all, data statistics were conducted which depicts in below-given Table 1. This data statistics describe the mean, median, and standard deviation of collected data. This also showed the missing values, Skewness, and kurtosis. No missing values were included in the data because these missing values damaged the normality of the data.

After removing the missing values and outliers from the data, the normality of data was analyzed through the measurement assessment model in Smart PLS (Hair, Hollingsworth, Randolph, & Chong, 2017). Normality of data analyzed through the value of factor loading, Alpha, Composite reliability (CR), and average variance extracted (AVE). The measurement model displayed in Figure 2 and values of the factor loading, Alpha, Composite reliability (CR) and average variance extracted (AVE) depict in Tables 2 and 3. The acceptance level for values of the factor loading, alpha, and composite reliability is greater than 0.7. The threshold level for average variance extracted (AVE) is above 0.5 (Hair et al., 2017). All values that are showed in Figures 2 and 3 described that all values are under acceptance level.

Validity of data is also tested in the measurement model along with reliability. Validity is analyzed by the value of HTMT. Arguing with Chin (1998) value of HTMT should be less than 0.9. HTMT showed in Table 4 and it depicts that values are under acceptance level.

After analyzing the reliability and validity of data, direct effect between the variables like (Crisis Response Management, GIS and Remotes, Unmanned Arial vehicles, Print Media, Social Media, Cloud Computing, Mobile phones, and Internet) were examined by a structural model assessment which creates through the Smart PLS (Henseler, Ringle, & Sinkovics, 2009). The structural model is displayed in below given Figure 3. All values are depicted in Table 5. Direct effect analyzed through the t-value and intensity of the relationship is through beta values. Results showed that information technology applications like (GIS and Remotes, Unmanned Arial vehicles, Print Media, Social Media, Cloud Computing, Mobile phones, and Internet) have a significant impact on crisis response and management because their t value is greater than 1.96 as showed (15.75, 2.467, 2.053, 2.024, 2.827 and 2.521) respectively. Relationship between information technology applications like (GIS and Remotes, Unmanned Arial vehicles, Print Media, Social Media, Cloud Computing, Mobile phones, and Internet) has a positive impact on crisis response management because all beta values (0.072, 0.709, 0.04, 0.119, 0.041, 0.046 and 0.146) are positive.

Figure 2 shows the r-square (R^2) rate which is 0.926. It is substantial r-square (R^2) agreeing with Chin (1998), which depicts that variables, specifically; IT applications like (GIS and Remotes, Unmanned Arial vehicles, Print Media, Social Media, Cloud Computing, Mobile phones, and Internet) put significantly 92.6% effect on crisis response management.

Table 1. Data Statistics

	No.	Missing	Mean	Median	Min	Max	SD	Kurtosis	Skewness
INT1	1	0	3.227	3	1	7	1.509	-0.516	0.125
INT2	2	0	3.175	3	1	7	1.779	-0.567	0.485
INT3	3	0	3.629	3	1	7	1.784	-0.602	0.364
MOB1	4	0	2.995	3	1	7	1.448	-0.142	0.532
MOB2	5	0	3.17	3	1	7	1.42	0.16	0.631
MOB3	6	0	3.103	3	1	7	1.468	0.072	0.658
CC1	7	0	3.134	3	1	7	1.476	0.234	0.707
CC2	8	0	3.216	3	1	7	1.438	-0.194	0.527
SM1	9	0	3.139	3	1	7	1.413	0.193	0.613
SM2	10	0	3.015	3	1	7	1.337	-0.1	0.584
SM3	11	0	3.124	3	1	7	1.33	0.326	0.646
SM4	12	0	2.861	2	1	7	2.237	-0.619	0.949
PM1	13	0	2.892	2	1	7	2.106	-0.484	0.924
PM2	14	0	2.918	2	1	7	2.211	-0.647	0.898
PM3	15	0	2.83	1	1	7	2.393	-0.841	0.921
UAV1	16	0	2.732	2	1	7	2.101	-0.232	1.065
UAV2	17	0	2.923	2	1	7	2.222	-0.612	0.976
UAV3	18	0	3.335	3	1	6	1.484	-1.021	0.22
GIS1	19	0	3.211	3	1	6	1.663	-1.385	0.148
GIS2	20	0	3.278	3	1	6	1.525	-1.257	0.093
GIS3	21	0	3.237	3	1	6	1.552	-1.309	0.157
GIS4	22	0	3.222	3	1	6	1.579	-1.454	-0.03
CRM1	23	0	3.345	3	1	6	1.519	-1.252	-0.031
CRM2	24	0	3.227	3	1	6	1.605	-1.299	0.243
CRM3	25	0	3.273	3	1	6	1.527	-1.298	-0.032
CRM4	26	0	3.278	3	1	6	1.551	-1.3	0.203

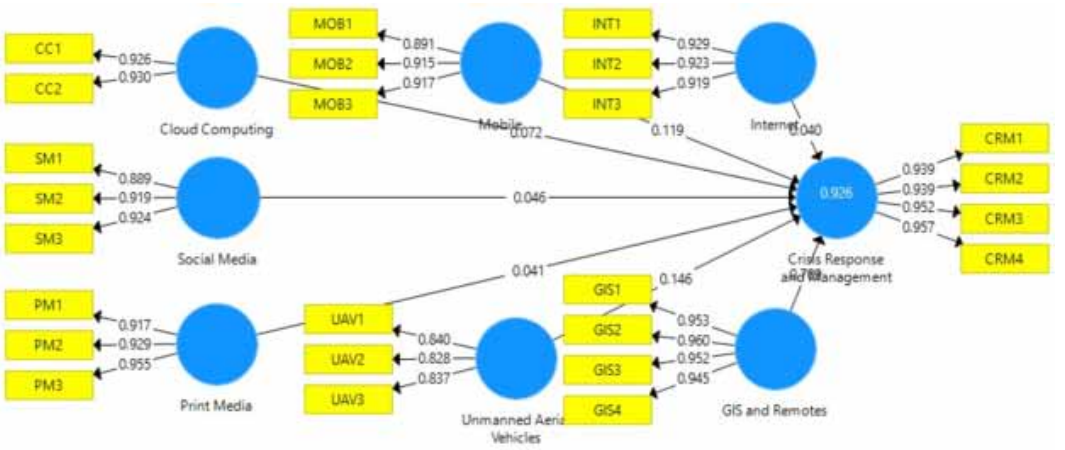
CRM: Crisis Response Management, GIS: GIS and Remotes, UAV: Unmanned Arial vehicles, PM: Print Media, SM: Social Media, CC: Cloud Computing, MOB: Mobile phones, INT: Internet

DISCUSSION

The objective of this article is to analyze the impact of use of IT applications like (GIS and Remotes, Unmanned Arial vehicles, Print Media, Social Media, Cloud Computing, Mobile phones, and the Internet) on efficiency of crisis response management in Pakistan. Several hypotheses are made to accomplish this objective and data is collected from employees working in national disaster management authorities.

The first hypothesis showed that the use of internet, Mobile phones, and media have a positive significant impact on efficiency of crisis response management. It means that the use of internet technology in case of disasters (natural and manmade) can control and respond better. Many previous studies also revealed that several connected devices and applications help manage the crisis. This

Figure 2. Measurement Model



study result supported by previous literature for see instance (Tolstykh, Kretova, Logun, Popikov, & Kuznetsov, 2020). Cloud computing base disaster or crisis management systems is an effective and efficient way in natural disasters. This cloud base system gives the fastest response and better management. It has changed the whole mentality toward managing disasters. Many previous studies have shown a positive link between cloud computing and response management of the natural crisis. In support of previous literature, this study also has given positive impacts of cloud computing on crisis (Huber, Jenkins, Li, & Nathanielsz, 2020). Use of GIS and Unmanned Arial Cehicles (UAV) has a positive significant impact on crisis response management. As GIS provides the geographical maps and UAV derived the high-resolution images of maps, locations, and geographical areas. These technologies are very helpful in managing and responding the crisis. Results of the current study are also supported by previous studies (Gaspar, Wizner, Morrison, & Dewa, 2020).

According to the objectives, it has been demonstrated that these IT technologies give new capabilities to crisis management agencies that were not before available. In non-disaster settings, these methods can be utilized for risk reduction planning and development. When a disaster occurs, they can assist in managing the flood of information that comes at an NDMA office in the immediate, post-impact period, which survey respondents regarded as the most crucial moment for successful IT performance. These tools can lighten the strain on employees and free them up to undertake other tasks.

CONCLUSION

Objective of the conducted study is to analyzing the impact of use IT applications like (GIS and Remotes, Unmanned Arial vehicles, Print Media, Social Media, Cloud Computing, Mobile phones, and the Internet) in crisis handling management in Pakistan. Employees who are working in national crisis/disaster management departments or entities of Pakistan were considered as a unit of analysis. Cluster and simple random sampling techniques which are the types of probability sampling methods were used for sample selection. Survey method is most suitable for this kind of study. Questionnaire items were administrated on 5 points Likert scale. For analysis of collected data Smart PLS was used.

In the areas of communication, coordination, visualization, and risk analysis, IT solutions offer tremendous promise for crisis management. Many technologies like (GIS and Remotes, Unmanned Arial vehicles, Print Media, Social Media, Cloud Computing, Mobile phones, and the Internet) are available for free and do not require the assistance of IT professionals. Nowadays IT application are very helpful in responding or managing the crisis. This study concludes that technology has

Table 2. Factor Loadings

	Cloud Computing	Crisis Response Management	GIS and Remotes	Internet	Mobile phones	Print Media	Social Media	Unmanned Aerial Vehicles
CC1	0.926							
CC2	0.93							
CRM1		0.939						
CRM2		0.939						
CRM3		0.952						
CRM4		0.957						
GIS1			0.953					
GIS2			0.96					
GIS3			0.952					
GIS4			0.945					
INT1				0.929				
INT2				0.923				
INT3				0.919				
MOB1					0.891			
MOB2					0.915			
MOB3					0.917			
PM1						0.917		
PM2						0.929		
PM3						0.955		
SM1							0.889	
SM2							0.919	
SM3							0.924	
UAV1								0.84
UAV2								0.828
UAV3								0.837

CRM: Crisis Response and Management, GIS: GIS and Remotes, UAV: Unmanned Arial vehicles, PM: Print Media, SM: Social Media, CC: Cloud Computing, MOB: Mobile phones, INT: Internet

been employed to fast-track disaster relief efforts. This implies that there is still a lot of space for development in the industry, and technologies that can overcome issues like coordination, cost, and human resource restrictions have the potential to significantly enhance the overall performance of crisis management organizations.

IMPLICATIONS

The scope of information technology is unlimited. None of the institutes or organizations is working without implementing the IT for its development (Conway et al., 2006). The use of IT for crisis

Table 3. Reliability and Convergent Validity

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Cloud Computing	0.839	0.839	0.925	0.861
Crisis Response and Management	0.961	0.961	0.972	0.896
GIS and Remotes	0.966	0.966	0.975	0.907
Internet	0.914	0.915	0.946	0.853
Mobile phones	0.893	0.893	0.934	0.824
Print Media	0.927	0.93	0.953	0.872
Social Media	0.897	0.897	0.936	0.829
Unmanned Aerial Vehicles	0.801	0.866	0.874	0.698

CRM: Crisis Response Management, GIS: GIS and Remotes, UAV: Unmanned Arial vehicles, PM: Print Media, SM: Social Media, CC: Cloud Computing, MOB: Mobile phones, INT: Internet

Table 4. HTMT

	Cloud Computing	Crisis Response Management	GIS and Remotes	Internet	Mobile phones	Print Media	Social Media	Unmanned Aerial Vehicles
Cloud Computing								
Crisis Response and Management	0.834							
GIS and Remotes	0.83	0.793						
Internet	0.713	0.716	0.713					
Mobile phones	0.704	0.724	0.819	0.721				
Print Media	0.481	0.587	0.6	0.424	0.446			
Social Media	0.515	0.873	0.876	0.711	0.883	0.486		
Unmanned Aerial Vehicles	0.759	0.857	0.858	0.584	0.713	0.885	0.741	

CRM: Crisis Response Management, GIS: GIS and Remotes, UAV: Unmanned Arial vehicles, PM: Print Media, SM: Social Media, CC: Cloud Computing, MOB: Mobile phones, INT: Internet

management is more important. A crisis can put the countries back by decades and centuries. But the implication of information technology for crisis management in Pakistan is very limited. The current study is documented as a theory that shows the importance of information technology for crisis management. This study has filled the gap of literature by focusing on the region of Pakistan for the study. It would be the new contribution toward literature to use the IT applications for quick response and effective management.

The study can also be used by the organization and departments which are working to manage the disasters. Study recommends the use of IT applications like the internet, Mobile phones, cloud computing, social media, and unmanned vehicles to overcome the impacts of these crises. Information technology could be used to improve the effectiveness

Figure 3. Structural Model

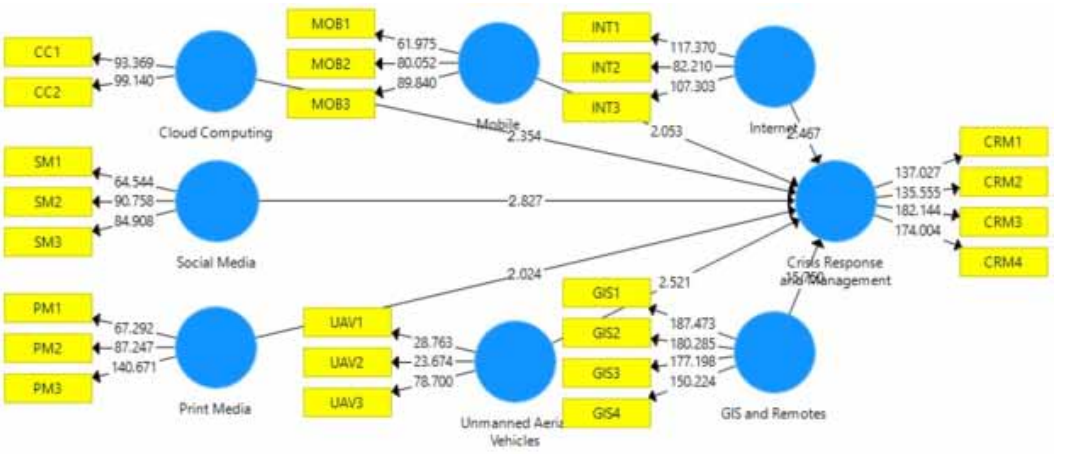


Table 5. Direct Effect Results

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Cloud Computing -> Crisis Response Management	0.072	0.072	0.031	2.354	0.025
GIS and Remotes -> Crisis Response Management	0.709	0.704	0.045	15.75	0
Internet -> Crisis Response Management	0.04	0.04	0.016	2.467	0.018
Mobile phones -> Crisis Response Management	0.119	0.12	0.058	2.053	0.041
Print Media -> Crisis Response Management	0.041	0.042	0.041	2.024	0.042
Social Media -> Crisis Response Management	0.046	0.045	0.016	2.827	0.007
Unmanned Aerial Vehicles -> Crisis Response and Management	0.146	0.15	0.058	2.521	0.012

CRM: Crisis Response Management, GIS: GIS and Remotes, UAV: Unmanned Arial vehicles, PM: Print Media, SM: Social Media, CC: Cloud Computing, MOB: Mobile phones, INT: Internet

of departments, to increase awareness, to predict the events, and to deliver information correctly, fast, and on the required time. Businesses and other organizations can also use the study on the strategic level to make the decisions at the executive level. The use of the advanced application can also make the management better and the response system could be improved.

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