IT's contribution towards Disaster Response

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Abstract

Timely interactions and coordination among the public emergency services plays a vital role for the better Disaster response and recovery efforts. IT can play a significant role that is used at narrow level. The modern and innovative use of the IT technology can more likely increase the effectiveness and efficiency of disaster response. In this article, we made an effort by proposing a model by keeping eyes on these advancements and innovative uses along with some challenges in Pakistani context.

Keywords: I*nnovation, Disaster, Efficiency, advancement and Challenges*

Introduction

Natural and man- made disasters, such as earthquakes, floods, plane crashes, high-rise building collapses, or major nuclear facility malfunctions, pose an ever-present challenge to public emergency services. It is impossible to deal with such disasters quickly and efficiently without the coordination and information. Departments like police, fire rescue, civil defense, public health and all other concerning are not supposed to react the situation efficiently and individually, but in a coordination manner. Inter and intra organization coordination is necessary for this. As coordination need current information, and it should be communicated upstream and downstream and within and between organizations same time.This creates the need of integrated communication and information system for disaster management that provides reliable, efficient and secure exchange and processing of relevant information.

The need and importance of disaster management information system is equal among all Nations suffering from natural and man-made disasters. The inability of Pakistan emergency response system to deal with the large scale catastrophes was first exposed during earthquake October 2005, which created a healthy need for this system to reduce the future loss. The beneficiaries of this IT advancement would ultimately be people of Pakistan living in un-served and underserved area as the disaster in the past have generally affected their population to a greater extent. By having this system, it will provide relevant data for post-disaster lessons learned analysis and for training. In this article we are proposing a disaster management information system providing an infrastructure for horizontal and vertical information flow for the adequate rescue effort. The sequence of this paper following introduction, section II contains user requirements, section III expresses the components of system , Section IV explains Design Model , Section V addresses Flow and application of Information and Section VI discusses the conclusion.

User Requirement Analysis:

Efficient disaster management system is the dream and challenge for very one, which encouraged scholar to find the ways to get it. According to one study, polled of experts opinion on existing systems is that maintaining the communication during disaster is the primary challenge. They found following major requirements are not yet in satisfactory way

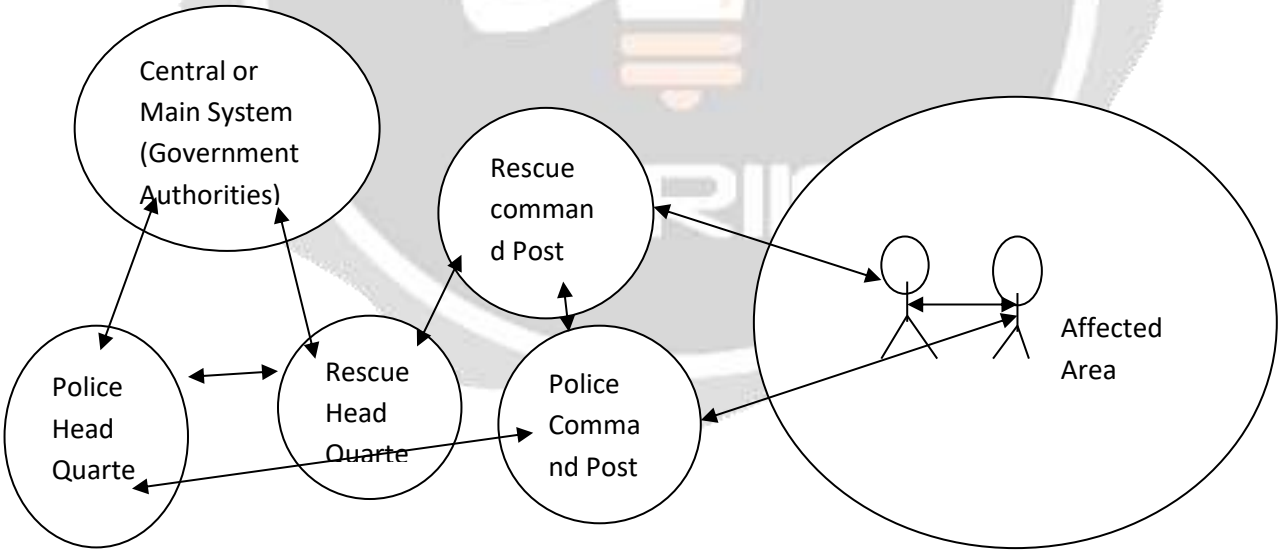
Integrated and linkage information
Fast Data Access
Timeliness and updating information
Availability of Communication
Homogeneous information

Before the 9/11 terrorist attack disaster like flood, earthquake were given higher importance by focusing on mobile communication centers and simulation and training but after 9/11, it got higher priority along with advanced technologies cyber security, authentification, image processing, sensors, logistics, knowledge management, and training to the technological focus areas, Fraunhofer Gesellschaft (2002).

Components of Disaster Management system:

Following components must have following characteristics
Demographic Distribution
Infrastructure lifeline and critical lines
Logistics and Transportation Routes
Hazard Assessment Mapping
Demographic Distribution
Vulnerability Assessment
Communication Facilities
Human and Material Response Resources
A system with the identified characteristics can be helpful in following ways
Preparedness planning
Mitigation
Response & recovery
Vulnerability, Hazard mapping will facilitate the preparedness planning and mitigation. This system will only be efficient if we manage it into central or main system to sub-systems. Here subsystems means at district and sub-district wise, in which these sub systems feed their input to their system and which update the every level until the central or main system.

Design Model for DMS:



Flow and Application of Information:

In this section we take bottom-up approach. In the model we describe how the frontline personnel (rescue) workers functioning in difficult may be benefit from the envisaged system. Fire fighter's equipments often consist of sensors and detectors, e.g for radiation or explosive gases. Traditionally observations are communicated by the voice communication to the squad leader which sometimes not reliable and communicate immediately. Reliable data

transmission and immediate response can be possible by fixing the smart sensors lined via networks, to the computer in squad leader vehicle. By using this update and reliable data, they can take the futher decision to overcome the situation. For some cases, measurement location coupled data using port- able GPS receivers, so that, for example, danger zones can be determined more precisely.

To handle difficult situations, the above mentioned hierarchy levels correspond to aggregation levels at which data is analyzed and communicated with upstream in reports and instructions downstream. Meanwhile decision should be taken in an ad hoc basis, which demands efficient access to the information which supports this decision. Thus our proposed application grant process all the data along with the other information, and process it and share it with other as per the information flow model appropriate as per the situation.Headquarters are supposed to act as interface with other agencies like public, due to their physical distance they are heavily dependent upon the updated information inflow. At the same time they have lot of past store data, the access of this data may be helpful for the site personnel. This calls for integrated application building. If disaster spreads HQ's operation directors may use portable information environment ready for relocation.

Communication Networks:

This section explains the issues and types of communication networks WAN and LAN. If the disaster is happen at multiple places then Wider Are Networks act as the main link with the several site hot spots. Even today some developing countries using the absolute technology like Radio broadcasting, and some has shifted to commercial wireless telephone communication but still wireless telephone communication have certain limits beyond the control, collaspe during disaster due to huge private demands and even due to infrastructure damaged. These systems may be helpful as the back-up systems.

Some advanced European countries are now adapting some TETRAPOL or ETSI TETRA 25 standards operating at 380-400 MHz as Saupp, H. (2002). We are proposing use WAN for the response System.

Furthermore we should consider the concept of hot spot communication. It refers to two types of locations, categorized as critical and Communication areas.

Critical Area:

Critical areas refer to the central area of danger of the disaster. In these areas the frontline personnel involved in handling the situation and they should put all their efforts to cope the situation. For them there is urgently need to inform without any delay to cope situation without getting it worst.This is also very important for frontline personnel to stay in contact with their leader to get the information which is not directly available to them. This information has to be communicated with the frontline personnel without their manually interactions may be through speakers, display technologies or other devices because we don't want to diversify their concentration from the main situation.

Most communicative areas:

These are the areas where we are compiling the information coming from all possible resources. The sources of the information may be different as local computer systems, measurement equipments, connection based information as telephone etc moving in and out of the hot spot.

In order to deal with such critical situation in which we are receiving lot of information WLAn should be used in order to set up the body/personal/local area network. While doing so we should address some medical issues like frequencies used with the body.

Data Management challenges:

From the previous discussion, Distributed applications for the disaster management have to deal with unreliable communication environment, Low data transmission rates, processing and storage capabilities of the devices suggested. It is very difficult and challenging to give quality guaranties for the communication. On one hand commands are given by the top departments based on the information which they are receiving from the frontline persons working in the critical situation and Vice versa peoples in these areas act on the instruction from the top. For both side complete information is equally important because as incomplete information may caused wrong decision.

Secondly decision in these situations are supposed to be taken quickly which required the fast delivery of information, but as we discussed the main challenges for data management in mobile and unreliable environments, especially in disaster situations, are reliability and performance.

Conclusion and Research Agenda:

In this article we proposed an integrated communication and information system for disaster response and recovery, data management along with the possible challenges. To get implementations of proposed system several IT research discipline supposed to work together to make it an effective, easy to use to response the emergency situations.

Data management must respond to static and dynamic data d where and when it is needed. Security is most important concern necessitating solutions for encryption, data integrity, and non-repudiation. Application and information flow designers must consider fast-changing working environments, and resource management is a challenge given the chaotic nature of disasters.

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