Efficient Planning and Management in Disaster-Prone Areas

Ashutosh Jaiswal
Vivekanand Education Society's Institute of Technology (VESIT) Mumbai, India

Geocey Shejy
Vivekanand Education Society's Institute of Technology (VESIT) Mumbai, India

Abstract –Natural disasters, including earthquakes, Tsunamis, floods, hurricanes, and volcanic eruptions, have caused tremendous harm and continue to threaten millions of humans and various infrastructure capabilities each year. It has highlighted our vulnerability to these natural disasters. This vulnerability is worsened by many organizations' increasing dependence on computers, telecommunications, and other technologies. In response, many organizations are implementing disaster recovery planning processes. In this paper we have analyze how to identify threats; how to eloquent the disaster recovery plan; and elements of the disaster recovery plan: Mitigation, preparedness, recovery and response. What kind of mobile application can be developed which will help peoples in emergency situation

Index Terms – Disaster Management, Mitigation, Preparedness, Emergency response Recovery, Firebase cloud messaging, Application.

1. INTRODUCTION

Natural disasters, including earthquakes, Tsunamis, floods, hurricanes, and volcanic eruptions, have caused tremendous harm and continue to threaten millions of humans and various infrastructure capabilities each year. Billions of people across more than 100 countries are periodically exposed to at least one natural disaster [1] , where around 30 natural disasters world-wide have been identified [2] . There is evidence that the frequency and extent of natural disasters are increasing on a global scale [3]. In the decade 1900 to 1909, natural disasters occurred around 70 times, but in the period 2000 to 2005 the number rose to 2,788 [4]. Natural disasters claim many human lives, damage a great deal of property, have devastating impacts on economy and environment [5]. For example, on December 2004, a massive earthquake of magnitude 9.0 struck the coastal area of northern Sumatra in Indonesia and this triggered the tsunami that affected Indonesia, Thailand, Sri Lanka, India, Maldives, Bangladesh, Malaysia, Myanmar and Somalia [6] [7]. It is identified as one of the deadliest and costliest disasters in history [8] [9] which caused an estimated US $ 9.9 billion worth of damages [10] and the death toll between 200,000 and 300,000 [11]. The total cost of natural disasters in 2008 was US$ 181 billion [12]. Therefore, the need to reduce disaster risks and develop a resilient community is of increasing concern in many countries [13]. There is a demand for a comprehensive disaster management (DM) including risk reduction program covering a wide range of disciplines, sectors and organizations, calling for diverse and expanded forms of partnerships [14]. The achievements from networking and collaboration can be far more powerful than individual or specialist contributions. According to the theory of organizational learning, inter-organizational information and knowledge sharing or GIS is important, because no single organization can have all the resources necessary to run its activities without inputs from other organizations [15]. Thus, GIS has been termed "the core" of DM [16]. However, an important challenge is to develop sustainable mechanisms and policies to link these DM-related organizations. These networks and collaborations can only be successful if these wide ranges of participants display the same commitment to share their information, knowledge, experiences and expertise. In their efforts to take counter measures against the threats posed by future natural disasters, the United Nations adopted "Principles for Natural Disaster Prevention, Mitigation and Preparedness and its Plan of Action" (UN/ISDR, 1994) by providing guidance on reducing disaster risk and the impacts of disasters. The creation and deployment of national, institutional and legislative frameworks requires research activities in the political science, legal studies, cultural studies and sociology; the assessment of existing human resource capacities for disaster risk reduction and the allocation of resources for the development and the implementation of disaster risk management policies calls for research activities in the organization and management sciences. Hence, this research aims to identify what are the success factors which best promote sustainable and effective government information sharing (GIS) and collaboration in DM. What kind of mobile application can be developed which will help peoples in emergency situation.

Natural Disaster Management

Events that have a massive negative large-scale impact on people have been inconsistently named "emergency", "hazard", "catastrophe", "incident", "disaster", and "crisis" in

the literature. Being consistent with the terminology of the International Federation of Red Cross and Red Crescent Societies (IFRC, 2010), the U.S. Federal Emergency Management Agency (FEMA) and the UN International Strategy for Disaster Reduction (UN/ISDR, 2004a), we use the term "disaster" in the following sense (IFRC, 2010): "A serious disruption of the functioning of society, causing widespread human, material or environmental losses which exceed the ability of affected society to cope using only its own resources". Disaster types and definitions have been discussed by Turner et al. [17], the World Health Organization and the Federal Emergency Management Agency [18]. The types of disaster have been reviewed, and it was found that natural, man-made and hybrid disasters cover all types of disastrous events. Natural disasters are catastrophic events resulting from natural hazards. Natural disasters result from internal (beneath the Earth's surface), external (topographical), weather-related (meteorological/ hydrological) and biological phenomena. Natural disasters are beyond human control. Natural disasters are naturally occurring physical phenomena caused by onset events which can be geophysical (earthquakes, landslides, tsunamis and volcanic activity), hydrological (avalanches and floods), climatological (extreme temperatures, drought and wildfires), meteorological (cyclones and storms/wave surges) or biological (disease epidemics and insect/animal plagues). Technological disasters comprise industrial accidents, transport accidents, nuclear accidents, among others. Man-made hazards include famine, food insecurity, and displacement of population, environmental degradation, pollution, and terrorism. There is broad agreement in the literature that activities and challenges of disaster management can be classified along the predisaster phase i.e. preparedness), during disaster phase i.e. response, and the post disaster phase i.e. recovery.

2. PHASES OF DISASTER MANAGEMENT

Mitigation

The Mitigation Phase seeks to prevent hazardous events when possible, reduce their severity when they actually do occur, and minimize the ensuing losses and damages. Although preventing or reducing the occurrence rate of natural disasters such as hurricanes, earthquakes, and floods is impossible, events *resulting from* the instigating event often can be mitigated and even prevented. Mitigating or Preventing subsequent events is the effect of steps taken prior to the initiating event's occurrence. When a disaster strikes, losses may be viewed as direct and indirect. Generally, direct losses are immediate and are caused by the disaster's occurrence (e.g., loss of property, loss of life). Indirect loss are economic and include losses incurred subsequent to the disaster, for example lost of future business. Losses directly caused by a disaster can be mitigated by steps taken long before the disaster occurs. The logic behind these mitigating actions is that on specific event -- for example, wind destruction from hurricane, pandemics fire, flood -- one identifies how damage is happen. For example Mostly people could stay away from hurricane threats by not locating in coastal areas; to stay away from earthquakes people can avoid locating near fault line. Such changes, however, are unlikely to happen.

Some examples of effective mitigating actions include:

- Building codes and other construction standards that specify that structures can withstand earthquake level shocks or hurricane winds.
- Fire retardant construction materials, fire breaks, fire doors and fire suppressant systems that reduce the direct and indirect losses due to fires. In addition to physical responses to fire, ensuring sufficient numbers of fire houses and other emergency services are available and locating those emergency services can reduce response times and also mitigate the effects of fires and other disasters.
- Locating facilities to avoid threats. While cities are where they are, the situation is different for factories, data centers, and service processing centers. Thoughtful planning and some precaution in considering underlying risks can cause companies to avoid disasters completely.

Preparedness

Preparedness prior to a disaster implicate putting in place the different steps called for by the disaster recovery plan. Five general steps include: Identifying threats and given these threats, targeting various scenarios that might manifest themselves; determining how a company will function if a disaster strikes, including which areas are critical and which are non-critical; identifying suppliers and customers needed to continue operating and given these relationships, ensuring that contact lists and communications links are in place; preparing for the possibility that business locations and supplies are inaccessible. (i.e., pre-positioning supplies and using alternate facilities); ensuring the members of the crisis management team have been identified and all individuals – from management team members to employees – know their roles and understand their responsibility if a disaster occurs. To prepare, First step is to identify pertinent disaster situation, which starts with recognizing natural hazards in the region, and evaluating risk and vulnerabilities. These helps to determine the specific disaster's effects and with guidance from the business manager, to highlight the required level of response. Finally, It is must to prepare and implement the preparedness plan. The University of Wisconsin Disaster Management Center suggested some steps which includes many of the points discussed above:

Step 1 is to determine, as discussed above via meetings with senior business managers, the objectives to be met in each affected sector;

Step 2 is putting in place the strategies and approaches necessary to accomplish these objectives and to fill in any identified gaps;

Step 3 is to document and implement the disaster preparedness plan – i.e., the formal document that specifies activities and the responsibilities of each participant;

Step 4 is to ensure that strategic resources used in response to a disaster are pre-positioned and that relationships with auxiliary parties are specified (e.g., suppliers, customers, business partners, internal employees); and

Step 5 is to train personnel in executing the plan and testing the plan via drills because a preparedness plan is of little value unless people have the tools, supplies, and training to execute it effectively.

Emergency Response

Emergency Response includes those immediate actions taken to deal with a disaster or an emergency. We include in "Response" detecting the disaster -- obvious in some cases such as hurricanes and earthquakes, but for biological disasters, a significant activity. The emergency response phase should address the disaster or emergency itself, as well as the problems that are caused by the disaster or emergency. For example, in the case of a flood this phase would call for rescuing people from flooded buildings, and then housing and feeding them before more permanent plans are made in the recovery phase. At the core of the emergency response effort is implementing procedures that tie together resources to achieve the immediate organizational objectives when confronted with a disaster. Most important is saving lives and ensuring the safety of all affected personnel. This includes that the proper safety equipment, evacuation plans, and linkages with safety authorities are in place, have been tested, and are operable. As a first step, an organization must decide where to locate emergency response facilities. For governmental organizations, this includes firehouses, EMS centers, and other first responder staging areas. One option that has been used successfully is to employ quantitative location models. A successful plan helps guarantee that adequate information exists and that this information is communicated effectively. 108 is a free telephone number for emergency services in India. It is currently operational in 20 states and two Union Territories. The 108 Emergency Response Service is a free service which provides medical, police and fire emergency services. The service is a public-private partnership between state governments and private Emergency Medical Service providers. This system was introduced nationwide by former union health minister, Dr. Anbumani Ramadoss. This 108 emergency service system was established by Central government of India. It was designed by Satyam InfoTech. As of November 2014 this service had handled over 5.4 lakh emergency cases in India

So, we can develop mobile application which will help peoples in such situation. "*Fig 1*" shows the block diagram of the system which can be developed. Initially, when we will click on the app, it should first check whether the location settings, data connection settings in the application are on or not. Then, it should track the location of the victim via GPS and then the user should register himself using his details which consist of his name, email id, contact number and his 4-relative contact id's During the time of accident, it should send these location co-ordinates in the form of URL through message to the registered contacts. Here, registered contacts means the contact details that are saved in the application database during its initialization. Now, at the received device, by clicking on the URL in the message, it spots the exact location of the victim. Also, as the message containing victim's location is sent he can be rescued safely.

How we can Implement

FCM (firebase cloud messaging)

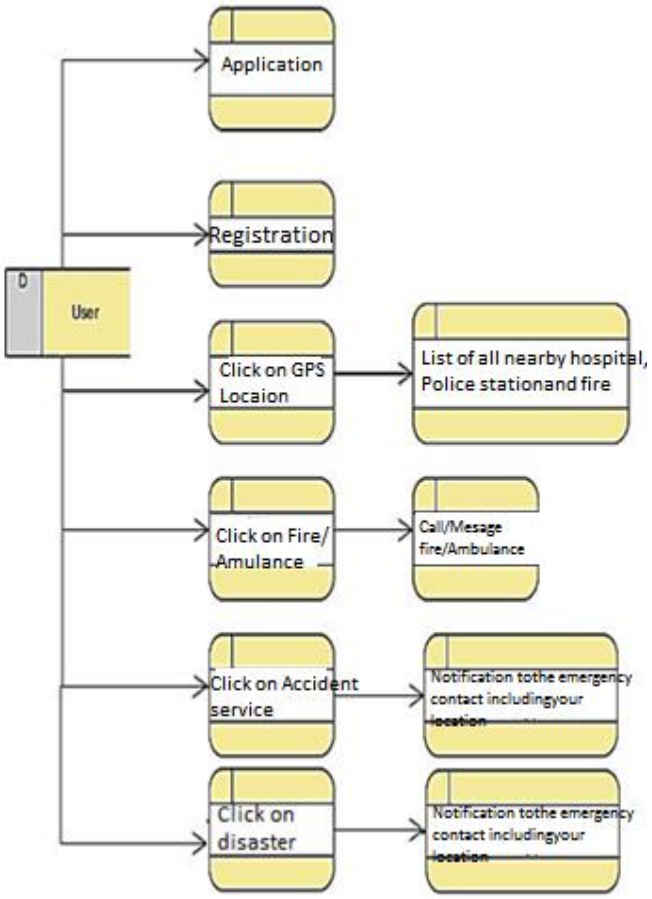

Fig I

Firebase Cloud Messaging is a cross platform messaging solution that allow you to deliver messages without any cost. So we can use this Google firebase cloud messaging to send notification to the emergency contacts including location when any disaster or accident occurs

Recovery

The objective of the Recovery phase is to eventually resume normal processing. What is "normal" depends upon the processing objectives as spelled-out in the disaster recovery plan. For example, the overall strategy might call for a select group of critical services to be up and running immediately. Another group might take a week and for significant disasters, another group might take a month or more. Each event requires separate actions, and even the same event affects different types of businesses in its own way. Some events, like hurricanes, can be foretold and personnel can be evacuated. Others, like earthquakes, tornadoes, power outages, happen suddenly. Some events place humans at risk and others affect business but not human safety. Regardless of the specific event, during recovery each of the four issues discussed above in the "Response" section must be addressed: Equipment and supplies; people; information and communication; and links with suppliers, customers, and external parties. Even given the safe evacuation of personnel, people issues are ongoing. For example, individuals rescued and working at a backup facility may still fell the trauma of the event itself; people may be affected by the safety and experience of other family members, acquaintances, or coworkers; employees who for the first few days expended "superhuman" effort during the response phase, may suffer burnout during the long term recovery period. The disaster recovery plan must not only include steps for physical recovery, but must also address the emotional stability of the workforce

3. THE DISASTER RECOVERY PLAN

The Plan Structure

The disaster recovery plan documents the steps for mitigation, preparedness, emergency response, and recovery. It is the result of a process that begins with senior management's awareness that a plan is indeed necessary, and ends with ongoing maintenance, testing, and if need be, implementation should a disaster occur.

4. CONCLUSIONS

Recent natural and man-made threats indicate that none of the business is resistant from disaster. Because more potential events can now affect a business, disaster recovery plans for one event such as a fire, may be inappropriate for another, such as pandemic. Plans must be wide-ranging in scope and must be robust More than ever before, organizations depend on other business entities, such as suppliers and business partners. Specialization and telecommunications and the ability to transmit large amounts of information accurately and quickly have led to many businesses becoming more "virtual." This poses two major risks: First, suppliers and business partners must be mingled in the planning process and into the plan also. A second risk occurs when the supplier or partner itself suffers a disaster. Many organizations now take planning for disaster as a given – a trend that only will increase. The challenge to managers is to blend the ongoing developments in processing and business operations with the capability to deal with disasters when they occur. To succeed, the basic elements of disaster recovery planning will remain the same: Committed business mangers; identifying and planning for specific scenarios; mitigating threats; preparing for disasters; responding to them; and recovering from them Also how one application can help in emergency situation by sending notification is also discussed.

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