

PRAGMATIC USE OF ICT FOR EFFECTIVE DISASTER MANAGEMENT GOVERNANCE AND PARTICIPATION

Maria Victoria G. PINEDA

Information Technology Department, De La Salle University
2401 Taft Avenue, Manila, Philippines
E-mail: mavic.pineda@delasalle.ph

Abstract

In an archipelago situated in Southeast Asia, the Philippines with close proximity to the Pacific Ocean, is a typhoon and tropical cyclone-friendly country. While the citizens across the islands are very familiar with typhoon behaviors, anticipation of the probable disaster may still be underestimated and conventional preparation would not be enough.

A disaster is a form of chaos that is very inimitable, unpredictable and pertains to real-time monitoring before, during and after it takes place. And ICT can take a strategic role as far as preparedness, response and rehabilitation efforts are to be made.

This paper intends to impart two pragmatic ways of utilizing ICT in disaster governance. First is facilitating cooperation among the different government agencies through a web-based Disaster Coordination System to address disaster management. A comprehensive workflow facility that permits remote exchange of data and transactions among regional centers, local municipalities and the national disaster coordinating council is the major feature of the system.

Second is applying concepts of human resources but at the same time addressing the peculiarities of a volunteer in the design of a volunteer management system for the Philippine National Red Cross. The system utilizes web and mobile technologies.

Both systems are perceived to be proactive and dependable references for policy-making.

Key Words: *disaster management, disaster systems, disaster coordination, government cooperation, citizen participation, Philippines*

JEL Classification: H41

1. INTRODUCTION

In 2006, Typhoon Xangsane hit the Philippines, Vietnam and Thailand. Typhoon Xangsane was a Category 5 or signal no. 4 in local typhoon system (Cuneta, 2009) when it entered the Philippines and brought strong winds, widespread flooding and landslides in the northern and central parts of Luzon. (Wikipedia, 2009)

In 2008, Typhoon Fengshen was a Category 3 that devastated central Philippines, the Visayas and Mindanao, the two big islands in the south. According to PAG-ASA, Typhoon Fengshen had an erratic movement. From a predicted northwest movement, the typhoon took a curve west. The PAG-ASA attributed its erratic movement with a high pressure area in the northern part of the country. (Uy, 2008)

In September 2009, Typhoon Ketsana at Signal number 1 brought a month's rainfall in six hours in the whole of Luzon. These were all *perfect storms*. A perfect storm is a term coined by Sebastian Junger to denote an atypical occurrence of two or more circumstances and harshly aggravates the situation. (Wikipedia, 2009)

In the fourth assessment report of the of the UN's Intergovernmental Panel on Climate Change (IPCC), "frequency and intensity of tropical cyclones originating in the Pacific have increased over the last few decades" and will continue to rise. (Cruz, et. al., 2007:473-474) From 1990-2003, the Philippines have an average of 20 cyclones a year with 8-9 landfall each year. (Ibid, p. 476) And each of these new cyclones do not just become strong but has certain uniqueness that can bring about a perfect storm and that likewise bring about perfect disasters.

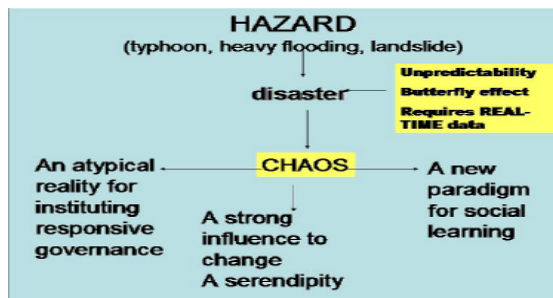
A disaster is defined by United Nations as "a serious disruption of the functions of a community or a society causing a widespread human, material, economic, and environmental losses which exceeds the ability of the affected community or society to cope using its own resources." (de Guzman, 2003:2).

A disaster is perceived to be human-made when the community or society fails to cope. With the help of science and technology, attempts are being made to prevent or reduce the damage of disasters (ibid). But based on real experiences, whether natural or manmade, a disaster is a form of chaos that is inimitable, unpredictable and requires real-time data. In the case of typhoons or tropical cyclones, these may have similar manifestations but the movement and characteristics would be different from one another. It is likely that each has a certain persona. The Philippines that is frequently visited by typhoons and tropical cyclones is accustomed with typhoon behaviours in the past but not during this decade. Xangsane, Fesngshen, Ketsana and the recent Parma that visited the country two weeks after Ketsana did, were all high-impact in strength and eccentric in behaviour.

1.1 The Model for the Disaster Management System Projects

A hazard such as typhoon, flooding or landslide can create or become a disaster, that even if technology can predict it or mitigate the damage, will still be characterized by peculiar behaviours and severed by other conditions like socio-economic, population, geographical location and climate conditions. Below is the Model of Disaster as a Form of Chaos used in this research and the development of the disaster management systems.

Figure 1 – A Model of Disaster as a Form of Chaos



Chaos theory proposes that “given the complexity of the forces and processes that determine the weather, it can never be predicted beyond a short period of time ahead and that chaos theory sets definite limits to the predictability of complex non-linear systems.” (The IMT, 2005)

Disaster as a chaos, similar to the perfect storm, can bring about something positive or something negative, with the combination of events or circumstances taking place. In the model being presented, the disaster becomes an atypical reality for instituting responsive governance, a serendipity or a strong influence to constructive change, and a trigger to a new paradigm for social learning.

In this light that ICT can play a strategic role. ICT can bring about various ways of responsive disaster management governance, can initiate a more progressive way of social learning and an influence for change be it in policy-making or even in planning directions.

Disaster management will have four major phases according to Cyganik (2003), and that would be mitigation, preparation, response and recovery. A good amount of planning and effort exerted in mitigation and preparation will result to a successful response. And recovery will entail longer time and higher budget.

Adopting this straightforward approach to disaster management and fused with the idea that ICT can introduce creative and practical solutions that initiatives on disaster management were undertaken.

In this paper, two disaster management projects for responsive governance are to be presented, namely, the Disaster Coordination System for national and regional disaster coordinating councils, and the Volunteer Management System for the Philippine National Red Cross.

These two non-commissioned projects were conceived in January of 2009 under the author’s initiative and mentorship in the College of Computer Studies, De La Salle University-Manila. Each project had four developers and both functional prototypes were finished after ten months. These are intended to be presented to the respective government agencies as research projects by first quarter of 2010.

2. A DISASTER COORDINATION SYSTEM for the NATIONAL DISASTER COORDINATING COUNCIL

2.1 The National Disaster Coordinating Council

The National Disaster Coordinating Council (NDCC) was established under the Department of Defense and the Secretary of National Defense heads the NDCC together with the other heads of 18 departments/agencies as members. It is through the NDCC member-agencies that disaster preparedness, prevention, mitigation, and response carry out its corresponding tasks and responsibilities that are under the NDCC system. (NDCC, 2008)

NDCC serves as the President’s adviser on disaster related programs undertaken by both government and private sector. NDCC serves as the top coordinator of all disaster-related issues and the highest allocator of resources. (ibid.)

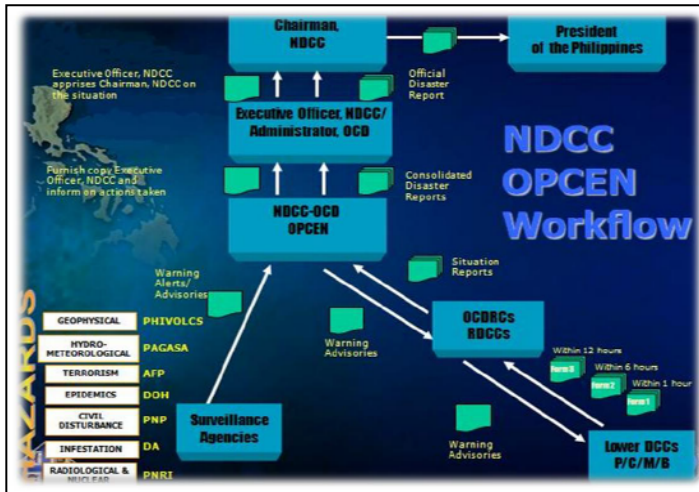
2.2 Highlights and Major Components of the Disaster Coordination System

Two days before Typhoon Ketsana arrived in the Philippines, the National Disaster Coordinating Council released its first bulletin to warn residents in low-lying areas. The following day, NDCC

raised another warning in Manila, Southern Luzon and the Visayas, and the typhoon was expected to intensify. The two warnings were translated as ordinary forecast reports by the Philippine Atmospheric, Geological and Astronomical Services (PAG-ASA). By September 26, Typhoon Ketsana uprooted 1million homes, killed 298 and destroyed Php9billion worth of crops and infrastructure. (Morales, 2009:28)

It was very evident that an effective coordinating system between the surveillance agencies (like health, weather, peace and order etc.), the government member agencies, local government units, private and non-governmental organizations should be in placed. A disaster coordination system may not be able to stop a disaster from happening but it can reduce the impact, raise preparedness, bring effective response and recovery. It will also provide a credible method of information dissemination.

Figure 2- Workflow of National Disaster Coordinating Council Operations Center



The diagram above shows the NDCC workflow and reporting flow. The NDCC Operation Center serves as the hub of coordination and situation reports. And this is what the NDCC Disaster Coordination System is all about. It further puts the mechanism for various government agencies including the local government units to report and escalate disasters before, during and after it takes place through the secure web-based system.

Major Components of the Disaster Coordination System

Central Coordination Module. This is the tool that NDCC can use to synchronize various tasks and communication to be executed with the other member agencies. This module also employed a *microblog*, patterned after Twitter and it is used in two ways. First, the public can follow and see announcements from the NDCC, the official and the unofficial reports. Second, member agencies of the NDCC can send inter-DCS messages through the same *microblog* to immediately report incidents, seek help or provide help.

Document and Archives Module. Disaster document reports coming from surveillance agencies can be submitted in forms of scanned images or Word documents (.doc) allowing remote transactions to be done. These reports are consolidated into a final disaster report by NDCC.

Metadata will be stored for each document. The final reports generated from the various disaster incidents are stored, archived and referred to for policy making decisions of NDCC.

Fund Allocation Module. As a coordinating agency, the NDCC is dependent on the funds that will come from other member agencies and the Office of the President. Hence the module is designed to consider the protocols and existing procedures of the NDCC in allocating financial support to the various Regional Disaster Coordinating Councils (RDCCs) and local government units. This module generates routine and adhoc reports and ensures control measures that encourage transparency of governance.

All modules are integrated enhancing the NDCC workflow and allowing a more ubiquitous web-based reporting.

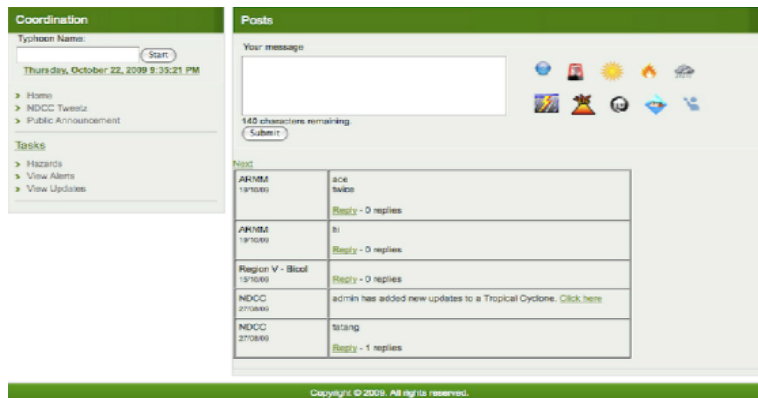
Figure 3- The Zouranoz Disaster Coordination System for NDCC, Main Screen



Figure 4- The List of the Member Agencies



Figure 5-The microblog screen for instant message trailing, modeled after Tweeter



Other Tools

The DCS is also designed to adapt some familiar and pragmatic tools that will allow the users of the system to find it highly usable.

- Authentication using the *captcha* in the registration is employed.
- A timer serves like a widget to alert the members of the council on the submission of reports.
- Disaster icons were designed to create interest and enhance user interface of the microblog.
- The DCS has used PHP as the web development language to allow flexibility of customization and portability.

2.3 Cooperation Between Government Agencies

Given the critical role of NDCC, it should be able to cope to fast and accurate information dissemination among various government agencies. NDCC should also provide ways and means for authorized government representatives to conveniently report, communicate or even submit documents and transactions while a disaster is taking place or even after it takes place. NDCC cannot afford to delay response to the victims as well as other people in need. NDCC should also hasten recovery efforts of local government units and should process the funding requests with control measures in placed. NDCC's coordination role is always critical. NDCC's coordination role should also empower other agencies to participate, take initiative to support and respond, and enjoy all stakeholders to collaborate.

And all of these are being addressed and pulled together by the DCS that was developed. Cooperation among government entities, trust on the NDCC advisory, empowered document workflow and coordination, efficient fund allocation and response are strengthened through this ICT solution. The DCS has the great potential to build a culture of efficient and effective reporting from the NDCC to and from the other government agencies.

3. A VOLUNTEER MANAGEMENT SYSTEM for the PHILIPPINE NATIONAL RED CROSS

3.1 The Philippine National Red Cross

The Philippine National Red Cross (PNRC) was created in 1947, its roots can be traced as far from the revolutionary government days of the Philippines. It has become the premiere humanitarian organization in the country. The volunteers and members of this organization are committed to quality life saving services that serve and protect not only the life but also the dignity of people especially the poverty-stricken Filipinos that are affected by unfortunate events. (PNRC, 2006) At present, PNRC experience continuous increase in the number of volunteer applications every year. There are over 300 active volunteers distributed in the main headquarters and 96 local chapters.

PNRC has been having issues in storing, retrieving and manipulating data about their volunteers. And ICT provides great opportunity to address these issues through the E-VAS Volunteer Management System.

3.2 The E-VAS Volunteer Management System: the Design and Essential Features

Figure 6- The existing Philippine National Red Cross website



Source: <http://www.redcross.org.ph/Site/PNRC/About.aspx>

Figure 7 –The Volunteer Search page of the E-VAS Volunteer Management System

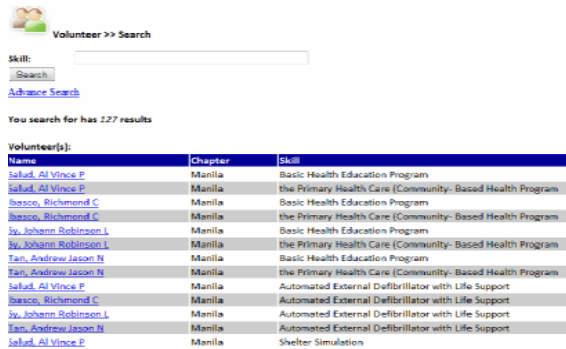


Figure 8- The Training Announcement Page



The E-VAS Volunteer Management System was designed and developed with the thorough understanding of the processes of Philippine National Red Cross (PNRC). The tasks and activities of the volunteers were taken into account and translated to allow more flexible participation. Below is the volunteer cycle that was adopted. Moreover, in the E-VAS system, any volunteer can join or enlist as a walk-in, online registrant or through any of the PNRC chapters.

Figure 3- The Volunteer Cycle



Source: Pineda, 2009: 4-2.

The E-VAS consists of *pre-deployment module*, *deployment module* and the *post deployment module*. The *pre-deployment module* has a sub-module which is the *volunteer administration*, the *deployment module* has the *volunteer profiling* sub-module and the *volunteer monitoring* sub-module is the sub module of the *post deployment module*.

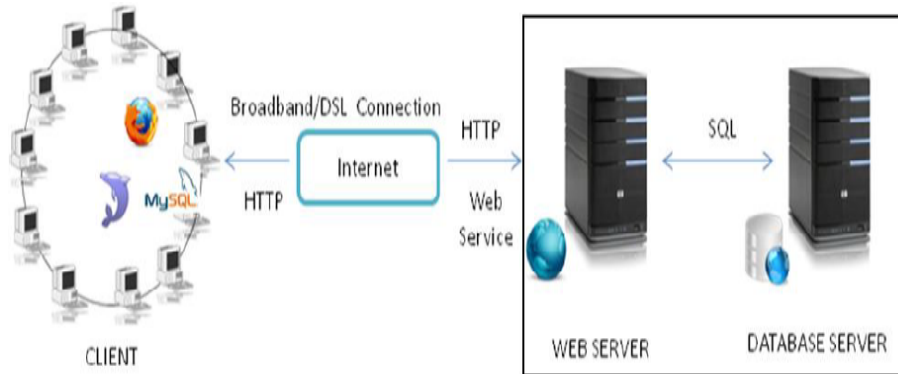
The Volunteer Administration sub-module is concerned in gathering information about the volunteers, storing and manipulating this information in order to support the operations of PNRC. This is also used during emergency and disaster operations. Training requirements will also be addressed and managed.

The Volunteer Profiling manages the skills inventory. It is responsible in giving PNRC the right volunteers for specific necessities based from their skills and trainings. This module will ensure

that the right volunteers are deployed in the disaster areas. This will give PNRC a glimpse of the capacities of each chapter and give decision makers basis in planning and implementing deployment.

The Volunteer Monitoring sub-module tracks all the deployment-related activities of the volunteer and determines the amount of volunteer work rendered for recognition purposes. The sub-module also renders deployment reports every 6 hours to efficiently monitor the volunteers and assists PNRC to determine whether to deploy or not other volunteer teams.

Figure 4- The System Architecture Diagram of the E-VAS Volunteer Management System



The E-VAS approach to the system development captures the requirements of PNRC, employs a doable system architecture, and encapsulates all the volunteer activities and processes. In addition, the use of the short messaging system (SMS) of a mobile phone is applied in all the modules and provide immediate way of communicating with the volunteers. Whether routine or adhoc reports, flexible report generation can be executed conveniently through the system.

3.3 Raising Volunteerism and Citizen Participation

A volunteer is an individual who expresses to perform or chooses freely to do a service. To volunteer to help is a noble intention that should not be put to waste. And to volunteer is good citizenship. And ICT plays a strategic role to know, to support, to manage, to monitor, to recognize citizens who volunteer to the Philippine National Red Cross. The use of the short messaging system (SMS) facility with the web-based volunteer management system creates an empowering and ubiquitous PNRC services. And this system merits the attention of PNRC.

Further, the volunteer management system determines the volunteer capacity the country has as far as disaster management is concerned.

4. CONCLUSIONS and FOLLOW THROUGH STUDIES

According to Aktan (1993:126-127), a pure public good and service that is by nature indivisible, draws positive external economies. 'External economies are defined as the consumption and/or production activities of an economic unit which affects, the benefit and/or cost functions of other economic units either positively or negatively.' (ibid, p. 124)

Disaster management has not been there in the past decades. But it is a pure public good and service. And now, it has become a formal public good and service that can involve the

government, voluntary organizations, outsourced or contracted parties to deliver the goods or render the services. Involvement of private and public entities is crucial to the delivery of the service. And its impact may be positive or negative to the other economic units or entities as described earlier.

The creative and pragmatic use of ICT can effectively deliver a pure public service that will benefit all societal stakeholders. The Disaster Coordination System and the Volunteer Management System can prove and show that ICT solutions are possible. These ICT solutions need not be very costly and complex in design but can bring unimaginable culture of cooperation in good governance and encourage high level of citizen volunteerism and participation.

Presently both National Disaster Coordinating Council and the Philippine National Red Cross do have web presence through each of its websites but working systems are not yet in placed. To realize the strategic use of the systems, the government should look into these Disaster Coordination System and the Volunteer Management System. The DCS and the VMS give the opportunity for the government to take a leap into better, trustworthy governance.

One recommendation to the systems is to expand collaboration and coordination activities with external and bigger institutions outside the Philippines.

Other on-going ICT-related research projects are the (1) disaster mapping system for the provincial disaster coordinating council that models a province with three major watershed dams, with mountainous terrain and low-lying areas ; (2) and a social network system to harness disaster preparedness knowledge hopefully creating a community of practice. It is also recommended that collaboration with the researches on the science of disasters be done.

BIBLIOGRAPHY

Aktan, Coskun Can (1993), "A Normative Analysis of Privatization: Which Public Goods Should Be Public/Private?" , *DEU-IIBF, Dergisi, Cilt. 8 Sayi:1 Yil: 1993*, pp. 124-138.

Cruz, R.V., H. Harasawa, M. Lal, S. Wu, Y. Anokhin, B. Punsalmaa, Y. Honda, M. Jafari, C. Li and N. Huu Ninh, 2007: Asia. "Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change", M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., *Cambridge University Press*, Cambridge, UK, 469-506, pp. 473-474, p.476.

Cuneta, John (2009), "Comparison of Typhoon Signals and Hurricane Categories", <http://laibcoms.asia/blog/laibeus/general2/comparison-of-typhoon-signals-and-hurricane-categories> [Accessed 28.12.2009]

Cyganik, Kimberly A. (2003), "Disaster Preparedness in Virginia Hospital Center-Arlington after Sept 11, 2001" *Disaster Management and Response* 1(3): pp. 80-86.

de Guzman, Emmanuel (2003), "Towards Total Disaster Risk Management Approach", *Proceedings of the Asian Conference on Disaster Reduction 2003*, February 2003, pp. 1-17.

[http://www.adrc.asia/publications/Asian_Conference_2003/E\)TDRM%20February%202003.pdf](http://www.adrc.asia/publications/Asian_Conference_2003/E)TDRM%20February%202003.pdf)

Morales, John Alliage (2009), Disaster Management, *Graphic Magazine*, 19 October 2009, Vol.20 No. 20. pp. 28-30.

NDCC (2008), About NDCC, The National Disaster Coordinating Council Website, 2008, http://ndcc.gov.ph/home/index.php?option=com_content&task=view&id=12&Itemid=26 [Accessed 12.12.2009]

PNRC (2006), “About the Philippine National Red Cross”, The Philippine National Red Cross Website, 2006, <http://www.redcross.org.ph/Site/PNRC/About.aspx> [Accessed 12.12.2009]

Pineda, Ma. Victoria, AlSherwin Ramos-Yeo, Johann Sy, Andrew Tan, and John Jefferson Uy, (2009), “The Philippine National Red Cross e-VAS System” (*unpublished*), presented and submitted 12 November, 2009, De La Salle University-Manila.

The IMT (2005), In Defence of Marxism: Chaos Theory, 06 January 2005, <http://www.marxist.com/science-old/chaostheory.html> [Accessed 22.12.2009]

Uy, Jocelyn (2008), PAGASA says typhoon had erratic movement, Philippine Daily Inquirer, 23 June 2008.

Wikipedia, 2009, A Perfect Storm, Retrieved from http://en.wikipedia.org/wiki/Perfect_storm [Accessed 22.12.2009]

Wikipedia, 2009, Typhoon Xangsane, Retrieved from http://en.wikipedia.org/wiki/Typhoon_Xangsane [Accessed 22.12.2009]

ENDNOTES

DCS – Disaster Coordination System

E-VAS/VMS –the E-VAS Volunteer Management System

LGUs- Local government units

NDCC – National Disaster Coordinating Council

PAG-ASA - Philippine Atmospheric, Geological and Astronomical Services

PNRC – Philippine National Red Cross

RDCC – Regional Disaster Coordinating Council

Surveillance agencies – refers to the government agencies responsible for reporting any disaster outbreak. Example: PAG-ASA, Department of Health, Philippine National Police

ACKNOWLEDGEMENT

The author wishes to acknowledge the support and technical competencies of the students who served as developers for the project: for the E-VAS Volunteer Management System —*Al Sherwin Ramos-Yeo, Johann Robinson Sy, Andrew Jason Tan and John Jefferson Uy*; for the Zouranoz Disaster Coordination System—*James Sy, Jhoana Tamayo, Sean Si and Cesar Padre*.