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SMS TECHNOLOGY AS DISASTER WARNING AND ALERT SYSTEM AS PERCEIVED BY SELECTED CONSTITUENTS OF DAVAO DEL NORTE

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ABSTRACT

Anchored on Davis' (1989) Technology Acceptance Model, three hundred constituents representing the three cities and eight municipalities of Davao del Norte were randomly surveyed on their perceptions about the use of Short Message Service (SMS) technology as a tool for sending disaster warning and alert messages. 145 males and 155 females answered the survey. Tagum City had the highest number of respondents (78) while the municipalities of San Isidro (8) and Talaingod (8) had the least. Results showed that SMS technology as practiced by the Provincial Disaster Risk Reduction Management Council of Davao Del Norte was perceived as good by 93.83% of the respondents. With a mean of 4.17, the use of SMS was perceived as a more credible source that prompted the people to demand for timely information from the authorities. Such communication strategy as coping mechanism was meant to prepare people to brace themselves for upcoming natural calamities. However, barriers such as network problems and hoax messages hindered the transmission of disaster warnings in real time and therefore must be addressed to institutionalize the operation so that SMS technology can better serve its purpose.

Keywords: SMS technology, disaster warning, alert system.

INTRODUCTION:

Disaster and emergency preparedness have recently reached the consciousness of the constituents of Davao del Norte. The people have become aware of the need to employ a disaster warning and alert system. One of the most popular approaches was the use of SMS technology. The disasters and threats that Davao del Norte had experienced during the landfall of the super typhoon locally known as Pablo (International Name: Bopha) have prompted its people to demand for timely information from the authority. They feared that similar incidents might happen again in the future. In addressing this growing concern, the Provincial Government of Davao del Norte, through the Provincial Disaster Risk Reduction Management Council (PDRRMC), took advantage of the SMS Technology as its disaster warning and alert system.

Disaster Warning and Alert System is a communication strategy that provides people early warning of all hazards, natural or manmade disasters, to create effective response actions to disasters before impact, thus dramatically reducing their effects on the lives of people and properties.

Short Message Service (SMS) or text messaging, on the other hand, allows text messages to be sent to and received from mobile devices (Kable, 2014). The authority to broadcast important messages is using it. In this case, it is anticipated that SMS will be well received since almost every Filipino household owns at least one mobile device capable of supporting SMS Technology (Roa, 2012).

The technology is expected to provide the people with a reliable and cheaper means for them to respond quickly to emergencies. However, no research was done on how the system is perceived by the intended recipients of the alert messages – the constituents of Davao Del Norte.

Hence, this study attempted to answer the research question: how do the constituents of Davao del Norte perceived the use of SMS Technology as a disaster warning and alert system? How acceptable is the disaster alert tool? How does information flow from the source to the intended receivers? What barriers, if any, would cause the delay in sending the message alert? What communication model or flow would be most appropriate in communicating disasters?

Specifically, the study aimed to:

1. determine the level of awareness of the constituents regarding the system;
2. gauge the system's level of acceptance to the people;
3. examine how the communication flows from the source to the intended receivers;
4. identify the barriers that would delay in sending the messages through SMS, if any; and
5. develop a more appropriate communication flow within PDRRMC internally and externally that will expedite communication of disasters.

For the Provincial Disaster Risk Reduction Management Council, results are highly valuable since actions of intended audiences highly depend on the acceptability of the communication approaches and in this case, the SMS technology.

REVIEW OF RELATED LITERATURE:

The decision to use a communication tool for disaster awareness does not solely depend on authorities. The intended audiences play a crucial role in its success and applicability. Notions of information technology use in this case, SMS and its perception thus form part of this study.

SMS TECHNOLOGY:

Information and communications technology-aided system such as SMS provides people with reliable, cheaper and effective means that enable them to respond quickly to emergencies. This has the potential to be an effective public communication system, which is essential for a real-time information exchange between the authorities and the people especially during emergencies and in times of disaster.

SMS or text messaging allows text messages to be sent and received to and from mobile devices. It is called short because the maximum number of characters for a single message is capped at 160 consisting of words or numbers or an alphanumeric combination. In case one sends a message longer than the maximum number of characters, it will be sent in multiple parts. In this case, some of the space reserved for characters is used as a data header that the receiving device recognizes as a multi-part message (Kable, 2014).

Unlike paging, SMS messages do not require the mobile phone to be active and within range since they can be held for a number of days until the phone is active and within range. SMS messages are transmitted with the same cell or to anyone with roaming capability. They can also be sent from a computer to an ordinary mobile

device such as the cellular phone and vice- versa.

THE IMPACT OF SMS TECHNOLOGY IN DISASTER PREPAREDNESS AND RELIEF:

Adverse impacts of climate change occur more frequently especially in vulnerable areas, citing Asia as the hardest hit region. Countries in South and Southeast Asia, including India, the Philippines, Bangladesh, Indonesia, China and Pakistan were reported to have the largest numbers displaced (Guha-Sapir et al., 2004). The costs of recovery are high and are yet rising. "In the last decade, average annual disaster costs have been $67 billion. This is a 14-fold increase since the 1950s" according to Guha-Sapir et. al. (2004). Furthermore, they added that population growth and urbanization are a part of the rising costs, but there have also been more reported disasters in recent years that greatly contributed towards the rising cost. Twenty years ago, there was an average of 200 reported disasters per year. Today, that number had doubled. In 2010, 45 million people were forced to flee because of the sudden-onset of natural disasters (Halff, 2011).

Therefore, given the trend on the increasing frequency of natural disasters and the growing population, there is a need to strengthen disaster response. In the past few years, many ICT and mobile technology innovations have greatly aided disaster relief, allowing affected people to get help faster. The availability of such technology has also increased global awareness and better reporting.

THE USE OF SMS TECHNOLOGY IN THE PHILIPPINES:

SMS Technology has extensive usage in the Philippines. The Ipsos Media Atlas Philippines Nationwide Urban 2011-2012 survey showed that nearly a third of urban Filipinos claim not to be able to live without their mobile phones.

According to the report "Information and Communications for Development: Maximizing Mobile," there were 101 mobile cellular subscriptions for every 100 people in the Philippines in 2011 which is 41 subscriptions up for every 100 people in 2005. The report defined mobile cellular subscriptions as "subscriptions to a public mobile telephone service using cellular technology, which provided access to the public switched telephone network." Postpaid and prepaid subscriptions were included. However, mobile subscriptions did not reflect actual mobile phone ownership since there could be multiple subscriptions.

The World Bank also reported that extensive usage of mobile phones in the Philippines has brought better information access for farmers, broader citizen engagement, link to traffic data for taxi driver, to name a few. Commercial farmers benefited from accessing price information through mobile phones, reporting income gains and increase trust of traders.

SMS in the Philippines is more than just plainly texting. The World Bank, in its report, cited the Philippines as an example in using mobile's potential to strengthen accountability and transparency in public services and processes.

USE OF SMS TECHNOLOGY FOR DISASTER PREPAREDNESS IN THE PHILIPPINES:

The Philippines has recognized SMS Technology as an important tool for social change (Roa, 2012). Due to its speed, efficiency, affordability and ubiquity, it is being used as a tool for disaster preparedness especially in areas like Davao del Norte where natural calamities are unpredictable. The southern part of the country normally is not prone to these but with climate change, it is one of the areas that are hardly hit.

THE PROVINCE OF DAVAO DEL NORTE:

Davao Del Norte is a first class province in the Davao Region located in the island of Mindanao. It is subdivided into eight municipalities and three cities, namely; Tagum City (capital), Panabo City and the Island Garden City of Samal.

The province is primarily agricultural but its citizens also engage in mining, forestry, and commercial fishing. Its principal crops include rice, corn, banana, coconut, abaca, ramie, coffee and a variety of fruit and root crops. Being the leading producer of banana, it is dubbed as the "Banana Capital of the Philippines."

Davao Gulf, to the south of the province, provides a living for many fisherfolk. Some of the fish products include brackish water milkfish, tilapia, shrimp, crab and freshwater catfish, and tilapia.

It is also a major producer of gold, and its mining resources include silica, silver, copper and elemental sulfur. There are some small-scale gold mining activities in the province and numerous active quarries of commercial quantities of gravel, sand, and pebbles for construction.

Tourism also contributes hugely to its economy. There are a lot of beaches in the Island Garden City of Samal including the famous Pearl Farm Beach Resort.

DISASTER WARNING AND ALERT SYSTEM IN DAVAO DEL NORTE:

The disaster preparedness campaign in Davao Del Norte began after Super Typhoon Pablo (International Name: Bopha) devastated the province, which resulted to three casualties and damaged over P4-billion worth of crops and infrastructure.

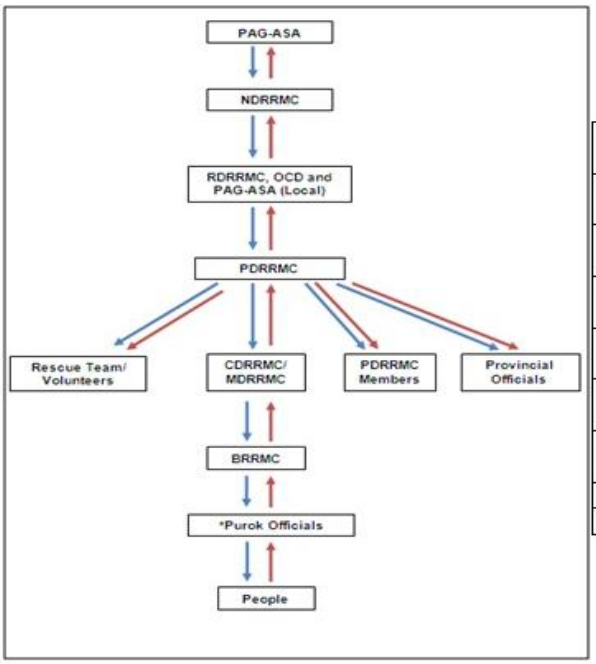
Governor Rodolfo P. del Rosario trumpeted a well-coordinated emergency plan carried out by the PDRRMC and the various DRRMCs of the different LGUs. One of the actions taken by the PDRRMC is disaster preparedness through the use of SMS Technology.

Emergency alert messages were sent to the people in Davao Del Norte when the province experienced several catastrophes after the typhoon such as the landslide in Barangay Mambing, New Corella, the flashflood in Talaingod and the rise of water level of Bingcungan River in Carmen and Tagum City in February 2013.

Mr. Sonio Sanchez, the head of PDRRMC of Davao del Norte is determined to strengthen disaster preparedness through SMS Technology since this is the fastest and most practical way of sending information to the public. However, the council faces so many problems during the communication process. During the onslaught of Super Typhoon Pablo, two big mobile communication tower networks got destroyed, delaying the arrival of the messages. Only one network was functional after the typhoon.

Unlike in Southern Leyte, Davao del Norte also lacks the resources to mobilize the project since it solely depends on the allocated fund, which is only 5% of the Calamity Fund of the provincial government. Also, PDRRMC does not have the Infoboard that can disperse messages in an instant. It still has to manually send the messages to the intended recipients.

Mr. Sanchez, despite these challenges, firmly believes that SMS Technology can be a great tool to give people the information they need when it comes to disaster preparedness because aside from being cheap, many households in Davao del Norte own at least one unit of cellular phone.



PAG-ASA	Philippine Atmospheric, Geophysical and Astronomical Services Administration
NDRRMC	National Disaster Risk Reduction Management Council
RDRRMC	Regional Disaster Risk Reduction Management Council
PDRRMC	Provincial Disaster Risk Reduction Management Council
CDRMMC	City Disaster Risk Reduction Management Committee
MDRRMC	Municipal Disaster Risk Reduction Management Committee
BDRRC	Barangay Disaster Risk Reduction Management Committee
OCD	Office of the Civil Defense
***Purok**	Each barangay is composed of puroks

Figure 1. Communication Flow of Text Messages Used by PDRRMC – Davao Del Norte

At present, the PDDRMC follows the communication flow presented in Figure 1.

In a normal circumstance, the information about weather forecast and assigning of storm signal number (in case of typhoon) comes from PAG-ASA. The blue arrow explains the flow of information from PAG-ASA down to the end-receivers – local people. On the other hand, the red arrow indicates the inverse flow of communication in cases that unpredictable events or unforeseen incidents happen in a certain area.

DAVAO DEL NORTE'S LEGAL FRAMEWORK ON DISASTER RISK REDUCTION AND MANAGEMENT:

The Provincial Government of Davao del Norte has formulated a new Executive and Legislative Agenda that give emphasis on having climate change-adaptive and risk-resilient communities as one of its key elements.

One of the objectives of this key element is to strengthen the communication system that can be used during emergency situations as well as in the preparation phase. The agenda also recognized that the provincial government still lacks a comprehensive disaster database and unified system of information dissemination. In addressing this urgent need, the provincial government formulated the following strategies:

- Develop and institutionalize a GIS-based Disaster Information Based Management System at the provincial, city/municipal levels to cover all disaster-related information; and
- Assess disaster risks due to natural and man-made hazards and vulnerabilities at different levels and different scales and make it publicly available.

It is also expected that by the end of 2014, a Sangguniang Panlalawigan Resolution adopting a comprehensive Disaster Risk Reduction and Management Plan will be completely formulated.

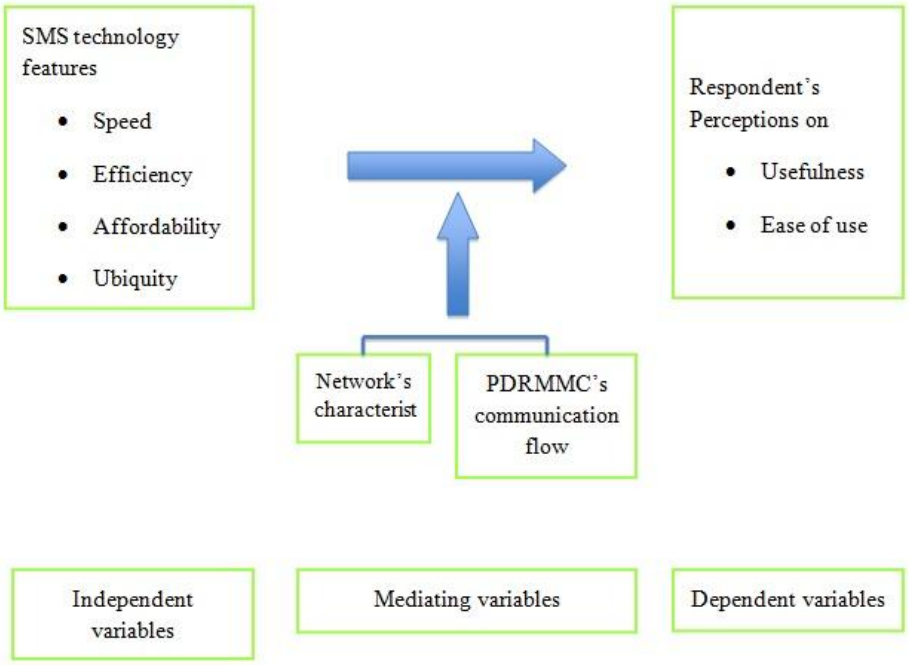
THEORETICAL FRAMEWORK:

Recent natural and human-caused disasters have prompted the people to demand for timely information from the authority to strengthen disaster and emergency preparedness. The Provincial Government of Davao del Norte took advantage of SMS Technology to provide the information needs of the constituents. Using a technology that was never used in the past can be challenging and risky especially when people's lives are at stake. Thus, it is necessary to establish how people perceive such communication strategy. The Technology Acceptance Model can aptly explain this assumption.

The Technology Acceptance Model (TAM) (Fred Davis, 1989), an information systems theory that models how users come to accept and use technology suggests that when users are presented with a new technology, their decision about how and when they will use it depends on the perceived usefulness and perceived ease-of-use. In other words, when people receive reliable information from a well received channel, they are more likely to have positive actions towards the prescribed behavior. Likewise, a well-received channel provides smooth communication flow that is free from any impediments that hinder information exchange or transfer.

Based on TAM, it can be assumed that if SMS technology is perceived to be useful and easy to use by the constituents of Davao del Norte then the communication technology would serve as an indicator of its acceptability and that using it would give benefits to its intended users.

CONCEPTUAL FRAMEWORK:



Perceived Usefulness and Perceived Ease of Use are determined based on the respondents' perceptions on how the features of SMS (speed, efficiency, affordability and ubiquity) are affected with the networks' characteristics and the communication flow employed by the PDRRMC.

Perceived Ease of Use refers to ''the degree to which a person believes that using a particular system would be free of effort'' (Davis, 1989). Given that effort is a finite resource, an application perceived to be easier to use

than another is more likely to be accepted by users (Davis, 1989). Perceived Ease of Use in this study was measured by asking the respondents to indicate the extent of their agreement with an item in the questionnaire on a five point numerical scale, ranging from 1-strongly disagree to 5-strongly agree. This was the item, "Aduna akoy madawat nga "alert messages" sa wala pa o pagkahuman sa kalamidad sama sa bagyo, baha, landslide, ug uban pa."

Perceived Usefulness was defined as "the degree to which a person believes that using a particular system would enhance his/her job performance" (Davis, 1989). Davis (1989) described a system high in Perceived Usefulness as one for which a user believes in the existence of a positive user-performance relationship. In this study, Perceived Usefulness means how SMS technology provides the users the information they need to better prepare themselves for a possible disaster or emergency. Four items were used to tap the Perceived Usefulness construct. Respondents were asked to indicate the extent of their agreement with each item on a five point numerical scale, ranging from 1-strongly disagree to 5-strongly agree. These items were (#3) Kasaligan ang maong "alert messages" nga akong nadawat.; (#4) Nadawat nako ang "alert messages" sa sakto nga oras; (#6) Klaro ang mensahe sa maong "alert messages" nga akong nadawat; and (#10) Magamit ang text aron mapasidan-an ang katawhan sa posible nga kalamidad.

METHODOLOGY:

The study employed a one-shot survey research design. Respondents who were randomly chosen from the three cities and eight municipalities of Davao del Norte are considered as the population for this research study since the PDRRMC has considered all areas of the province vulnerable to natural cataclysmic events.

Three hundred respondents (provided that they own at least one functional cellular phone or any mobile device that is capable of sending and receiving SMS) were randomly chosen. This number was further divided into two since the province is composed of two districts. The representative per local government unit was determined using the following formula:

$$\frac{\text{Total Population of the LGU}}{\text{Total Population of the District}} \quad X \quad 100$$

A pretested survey questionnaire was used to gather data. It contained a list of items that determine the perception of respondents on the use of SMS technology as a communication tool that gives them alert messages to strengthen their disaster preparedness and response. They rated each item from 1 to 5; 5 signifies strongly agree and 1 means strongly disagree. A space is also provided in the questionnaire should the respondents wish to discuss briefly some issues and concerns not covered in the questionnaire.

Data was analyzed using frequency counts and percentages.

RESULTS AND DISCUSSIONS:

A total of 300 respondents were surveyed. More than one third of the total number of respondents, the highest number, is from Tagum City (78). The municipalities of San Isidro (8) and Talaingod (8) have the least number of respondents.

Table 1: Distribution of respondents by location

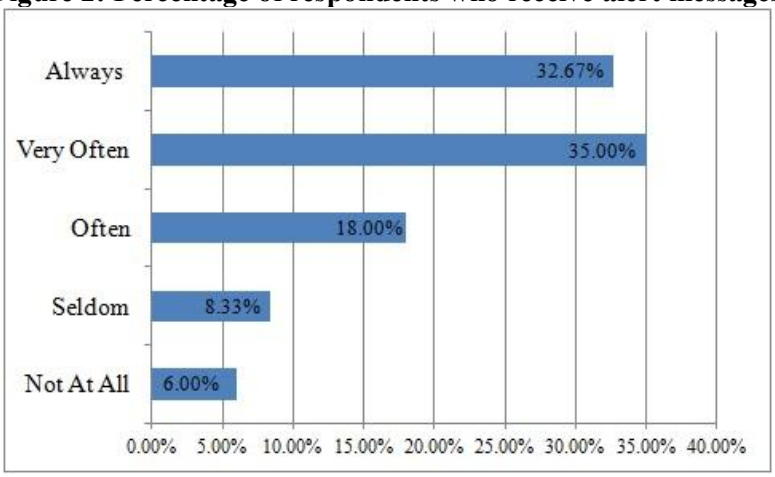
Name of LGU	Number of Barangays	Total Population	Number of Respondents
District 1			
Asuncion	20	55,844	18
Kapalong	14	68,261	22
New Corella	20	50,699	16
San Isidro	13	25,548	8
Tagum City	23	242,801	78
Talaingod	3	25,566	8
	93	**468,719**	150
District 2			
B.E. Dujali	5	28,339	9
Carmen	20	69,199	22
Island Garden City of Samal (IGACOS)	46	95,874	30
Panabo City	40	174,364	55
Sto. Tomas	19	109,269	34

	130	**477,045**	150

It is interesting to note that 68.93% of the respondents are SMART subscribers (excluding those who are subscribed to smart and other network/s at the same time). Its close competitor, Globe, placed far behind (12.86%) although it ranked second. Some of the respondents are subscribed to more than one network.

The second part of the questionnaire contains items that would determine respondents' perceptions on the use of SMS Technology as disaster warning and alert system. Respondents rated each item that signifies the extent to which they strongly agree (5), agree (4), neutral (3), disagree (2), strongly disagree (1).

Figure 2: Percentage of respondents who receive alert messages



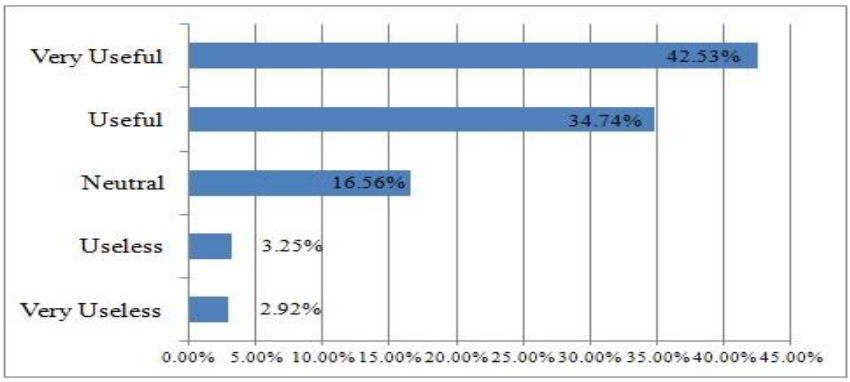
Thirty five percent of the respondents confirmed that they received alert messages very often. This number is close to those who answered always which is 32.67% while those who responded often accounts 18%. This means that 85.67% of the respondents have received alert messages at least often.

Table 2: Source of messages as perceived by the constituents

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Authority	33.33%	31.65%	18.52%	9.76%	6.73%
NGO	13.93%	30.71%	31.07%	12.50%	11.79%
Forwarded from contacts	20.28%	32.74%	25.62%	11.03%	10.32%
Unknown Senders	7.89%	19.71%	27.24%	19.00%	26.16%
Others	8.11%	12.84%	27.03%	16.89%	35.14%

More than thirty three percent strongly agree and 31.65% agree that the messages come from the authority whether from the PDRRMC, City or Municipal Government, Barangay or Purok Council. Also, 89.11% of the respondents (31.63% have expressed a deep understanding) know what PDRRMC is all about and its operations. This is a clear manifestation that the people in Davao del Norte have responded positively to the well-coordinated emergency plan of Governor Rodolfo P. del Rosario carried out by PDRRMC and local DRMMCs of different LGUs. This also supports World Bank report that the Philippines is using mobile's potential to strengthen accountability and transparency in public services and processes (Development Market Place, 2012).

Figure 3: Percentage analysis on the perception of constituents towards SMS Technology



Furthermore, SMS Technology is well perceived by the constituents as a means to alert them in case of disaster or emergency (42.53% of the respondents have signified their strong agreement and 34.74% said they agree). This is further supported with a mean of 4.11 in relation to their perception towards the Disaster Warning and Alert System operation of PDRRMC. They also believe that PDRRMC should take advantage the technology's benefits (4.17). These results signify that SMS Technology, based on the Technology Acceptance Model, is well accepted by the constituents and really serves its purpose.

A little over forty seven percent of the respodents strongly agree that there is a need for the authority to send SMS to alarm the people when there is possible disaster. 30.20% are in agreement while 17.11% are neutral. This is supported with the mean of 3.38 that corresponds to the reliability of the alert messages, 3.75 for their clearness and 3.26 for timeliness. This result supports the findings of Roa (2012) that SMS is an effective public communication system for a real-time information exchange between the authorities and the people especially during emergencies and in times of disasters because it is fast, efficient, affordable (or at no cost) and ubiquitous. This can also be attributed to a number of success stories reported by the PDRRMC like the successful evacuation of the residents in some areas in Talaingod and near Bincugan river when the water level rose considerably because of the heavy downpour a few weeks after typhoon Pablo.

Meanwhile, 49.09% of the respondents take immediate actions towards the messages that they received. They consider them as a warning thus, there is a need to prepare to avoid the risks (3.89). Oftentimes, respondents forward the messages to other people to spread the warning (3.78).

Table 3: Reasons of the delay of message delivery

Problem	Mean
Network down/problem	3.71
Unstable signal	3.79
Problem/s from the sender	3.11
Defective mobile device	2.98
Others	2.49

In case there is a delay in the delivery of these messages, respondents feel that the main reasons are unstable signal (3.79) and network problems (3.71). Some consider the problem/s that emanate from the sender/s (3.11) to be another reason as well.

Unstable signal has been a big impediment in message delivery. 84.83% of the respondents (with 31.38% have signified their strong agreement) have at least considered this as a problem.

Furthermore, the great disparity in the distribution of mobile network subscribers was one of the reasons why many people complained about the delay in the delivery of the messages due to unstable signal and network problem shortly after typhoon Pablo since the tower of SMART, the widely used network in the province, got destroyed as reported by the PDRRMC.

Although respondents feel that SMS Technology is very beneficial, it ranked fourth among the means of disseminating information on disaster preparedness and response, with a mean of 3.76, only behind Television (4.56), Community Announcement (4.42), and Radio (4.24). This result can help the PDRRMC decide to take advantage of other perceived effective channels to supplement the SMS Technology.

Furthermore, respondents are firm in believing that PDRRMC should have a dedicated phone number for its operation so that people will be certain that the alert messages they receive are from the right authority (4.32). In fact, percentage analysis shows that 95.59% of the respondents are at least in agreement, that is 56.61% strongly agree, 25.71% agree and 13.22% neutral, that this must be given utmost consideration by the authority.

Many respondents further suggested that the authority, in this case the PDRRMC, should intensify the SMS Technology for disaster preparedness. It should be clearly stated in the alert messages where they come from so that people can filter out which messages should be trusted or discarded. Many people have experienced receiving prank messages. Some of those hoax messages have caused people to panic and eventually resulted for some to evacuate even without proper advice from the authority. These suspicious messages form a big barrier not only in achieving smooth communication flow but also adversely affecting the relationship between the authority and the people in terms of trust.

Some respondents feel that it is also important that PDRRMC will employ additional personnel who will be assigned in each barangay whom local people can run to should they need to know some information about the operations of the agency.

Intensifying SMS Technology entails stable and reliable signal at all times. Some respondents are worried because they have experienced network and signal troubles during emergency situations especially those that are caused by the heavy downpour. They recommended that the government urge the large cellular networks in the province to upgrade their communication facilities.

The development and institutionalization of a GIS-based Disaster Information Based Management System through the formulation of a Sangguniang Panlalawigan Resolution adopting a comprehensive Disaster Risk Reduction and Management Plan would be vital to strengthen the communication system that will be used for effective disaster and emergency response (Executive-Legislative Agenda of Davao Del Norte, 2013).

CONCLUSION:

The findings of the study show that the SMS Technology as Disaster Warning and Alert System is well received by the constituents of Davao Del Norte believing that it can strengthen disaster and emergency preparedness. Respondents also believe that the alert messages sent to them through Short-Message-Sending or SMS come from the authority, in this study the Provincial Disaster Risk Reduction and Management Council (PDRRMC) of Davao Del Norte. The alert messages are delivered on time and contain appropriate message or information that give them updates about the current condition of the weather and on what to do in case of emergency situations.

However, they are worried that they might experience delay in receiving alert messages again, just like what happened during the onslaught of Super Typhoon Pablo when SMART and SUN towers got destroyed that eventually caused network troubles directly affecting their subscribers. Considering that SMART has the biggest number of subscribers in the province, troubles caused by the network itself can pose serious problems in using SMS Technology for this operation.

Furthermore, respondents strongly agree that PDRRMC should have easy to remember dedicated cellular phone number/s for this particular operation so that the messages they broadcast to the people can be fully trusted. This is to avoid receiving prank messages from unknown senders that even resulted to ill-advised evacuation. These hoax messages are considered big barriers that affect the reliability, let alone the effectiveness of the technology. Thus, it is imperative that the authority will remove the said barrier so as to achieve effective communication.

From this analysis, the study then suggests that PDRRMC should directly send the messages to the people. This means that the messages will be sent to all levels below the PDRRMC in the Communication Flow Structure at the same time. Therefore, there will be only one level after the PDRRMC. This level shall be composed of the Rescue Team Volunteers, PDRRMC Personnel, CDRRMC/MDRRMC, and Provincial/City/Municipal Officials, Local Community / Barangay / Purok Leaders and the people. This will help preserve the content and hasten the delivery of the messages. However, this entails the use of a more sophisticated technology that can act as database containing people's cellular phone numbers and other data needed in the operation.

RECOMMENDATIONS:

A. PRIMARY AUDIENCE:

1. Constituents of Davao Del Norte. People must be responsible and knowledgeable enough to examine the reliability and validity of the content of the messages they received by accessing other information sources like radio, television, newspaper, internet or community announcement. When they are not sure about the origin of the alert messages they received, they should not forward them to others to avoid confusion.

2. Provincial Government of Davao Del Norte. The provincial government must intensify the said operation by including the use of SMS Technology as one of the strategies to enhance preparedness of all LGUs for effective response as formulated in its newly crafted Executive and Legislative Agenda. They must also urge the leading communication networks to strengthen their communication infrastructures for a stable and reliable signal at all times. They can further expedite the process and delivery by using a more sophisticated technology that can send messages to all users in a blast. This can be done by establishing a partnership with the leading communication networks to make this advanced technology available in the province.

3. PRDRRMC. The council must use easy to remember dedicated cellular phone number/s or emergency contact hotline (i.e, 911) that can be accessed using a mobile device subscribed to any of the available networks in the province. This is to avoid confusion since respondents also receive prank messages from unknown senders whose intention is just to make fun and scare other people. They can tap local community leaders or barangay functionaries to create a database that contains the active number/s of their constituents or they can directly ask the people to register their numbers by following some prescribed format in texting.

It is also suggested that PDRRMC should formally introduce the SMS Technology as Disaster Warning and Alert System to the constituents so that they would understand the processes involved in the operation and most of all the desired behavior that the authority would like them to develop. This can be done through a radio/TV plug or via SMS, leaflet, fact sheet or brochure distributed to the constituents. PDRRMC can also tap community leaders for a more intimate interaction with local people to discuss about the system and its benefits since despite the ubiquity of mobile phones in the province, community announcement, through "bayanihan" or community meeting, is still considered the most effective and trusted means of disseminating information especially in far flung areas. Another way is to tap local schools by conducting symposia to motivate and encourage students to be the authority's active partners.

PDRRMC can also take advantage of a meme (e.g. "Likayi ang Kasubo, Maminaw sa Pahimangno") for an effective memory recall and to influence the constituents to accept the desired behavior. They can also make a social marketing campaign that advocates for responsible texting emphasizing the active role of the people in the implementation of the SMS Technology as Disaster Warning and Alert System.

SECONDARY AUDIENCE:

1. Researchers. It must be noted that what is looked into in this study is the perspective of people in Davao Del Norte pertaining to the use of SMS Technology as disaster warning and alert system. Their perceptions may be right as they are the first to see and experience the effects. But this should not be the only measurement of the technology's effectiveness. Aside from getting the responses and perspectives of the people, there are still many other tools to implement to accurately assess its effectiveness. With that, this study was able to at least touch one part of the vastly wide area in the test of effectiveness. The study then recommends that another research be conducted dealing on the aspects of effectiveness that are outside the scope of perception. Also, if another perception analysis be conducted, it is recommended that government leaders, agency personnel, community leaders and other people who are directly involved in the operation serve as respondents.

2. Other Provinces/ Local Government Units. Neighboring and even other provinces outside Davao Region can learn from the experience and duplicate what Davao Del Norte has been doing to strengthen disaster and emergency preparedness. They can communicate with PDRMMC – Davao Del Norte and discuss with the provincial officials on how they can follow suit and implement the technology.

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MEAN ANALYSIS:

	Name of LGU/ Number of Respondents												Average
	Asuncion (18)	Kapalong (22)	New Corella (16)	San Isidro (8)	Tagum City (78)	Talaingod (8)	B.E. Dujali (9)	Carmen (22)	IGACOS (30)	Panabo City (55)	Sto. Tomas (34)		
1. I receive "alert messages" as warning for a possible disaster that might hit our area.	3.00	4.58	4.00	3.38	3.72	4.38	3.89	4.05	3.97	3.24	4.38		**3.80**
2. I believe that these "alert messages" come from:													
**Authority (PDRRMC, Municipal or City Government, Barangay Council, Purok leader, Police, etc.)	3.28	4.50	3.47	3.25	3.67	3.63	3.78	4.05	3.80	3.48	4.26		**3.76**
**Non-Government Organizations	2.78	3.91	3.00	3.00	3.08	3.50	2.86	3.29	3.43	3.27	3.25		**3.22**
**Forwarded to me by my contact/s	2.83	4.00	3.71	2.86	3.18	4.33	2.38	3.05	3.67	3.87	3.66		**3.47**
**Unknown sender	2.56	3.18	2.43	2.63	2.53	2.50	2.25	2.43	3.43	2.50	2.47		**2.64**
**Others	1.50	1.00	2.71	1.00	2.43	1.50	2.80	2.23	3.33	2.68	2.43		**2.35**
3. The alert messages I received can be trusted.	2.56	4.09	2.93	3.29	3.32	4.29	3.33	3.55	3.37	3.04	3.94		**3.38**
4. I received the "alert messages" on time.	2.28	4.05	2.25	2.25	3.45	3.57	2.67	3.70	3.40	2.92	3.79		**3.26**
5. The reason/s of the delay of the "alert messages":													
**Network down/problem	3.17	4.32	3.94	3.00	3.73	3.25	3.56	3.82	3.63	4.00	3.31		**3.71**
**Unstable signal	3.56	4.45	3.93	3.00	3.92	3.43	3.67	3.73	3.96	3.73	3.41		**3.79**
**Problem/s from the sender	2.83	3.36	3.23	2.75	3.16	3.00	3.13	3.00	3.52	3.04	2.84		**3.11**
**Defective mobile device	3.11	3.55	3.21	2.29	2.88	2.83	3.22	2.64	3.63	2.78	2.77		**2.98**
**Others	1.25	1.00	3.25	1.00	3.06	1.50	2.33	2.57	2.90	2.50	2.64		**2.49**
6. The message of the "alert messages" is clear.	3.33	4.29	3.17	3.00	3.90	3.00	4.00	3.79	3.88	3.58	3.96		**3.75**
7. I do this after receiving the "alert messages":													
**Think of them as a warning so I must prepare	2.72	4.45	3.63	2.86	4.03	4.29	4.11	4.19	3.77	3.72	4.22		**3.89**
**I forward them to other people	2.85	4.09	3.50	2.71	3.94	4.33	4.11	4.09	3.72	3.68	3.91		**3.78**
**I don't care	1.83	1.95	1.75	2.38	1.78	2.33	2.14	1.95	3.41	2.18	2.60		**2.18**
**Others	1.38	1.00	2.75	1.00	2.88	3.25	1.00	2.62	3.33	2.54	1.80		**2.39**
8. I know about PDRRMC and its functions.	3.28	4.55	3.81	3.38	3.53	4.13	4.11	3.71	3.57	3.96	4.09		**3.79**
9. There is a need for the authority to send "alert messages" through SMS to alert people for possible disaster.	3.44	4.36	4.44	3.25	4.05	4.50	3.89	4.45	3.90	4.41	4.50		**4.17**
10. SMS is a useful tool to warn the people for possible disaster.	3.28	4.36	4.00	3.25	3.99	4.29	4.11	4.41	3.80	4.36	4.56		**4.11**
11. The authority should have a dedicated cellular phone number for this operation.	4.17	4.27	4.31	3.63	4.34	4.38	4.67	4.43	3.97	4.43	4.55		**4.32**
12.How effective are the following means in disseminating information about disaster or emergency situation?													
**Radio	3.56	4.27	4.50	3.25	4.41	4.57	3.56	4.38	3.87	4.28	4.56		**4.24**
**Television	4.11	4.91	4.88	3.25	4.70	4.14	4.11	4.64	3.97	4.75	4.82		**4.56**
**Newspaper	3.06	3.09	4.25	3.13	3.60	3.43	3.25	3.95	3.73	3.67	3.61		**3.59**
**Text Messaging (SMS)	3.33	3.32	3.94	3.25	3.47	4.43	3.44	3.95	4.13	4.04	4.00		**3.76**
**Flyers	2.78	2.77	3.47	2.25	2.88	2.50	2.88	3.21	3.87	2.84	3.00		**3.00**
**Community Announcement	4.89	4.41	4.50	4.50	4.39	4.38	4.78	4.43	4.10	4.25	4.61		**4.42**
**Others	1.27	1.00	2.50	1.00	2.93	1.50	1.00	3.22	3.78	2.50	2.45		**2.49**

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PERCENTAGE ANALYSIS:

	5	4	3	2	1	Total	5	4	3	2	1	
1. I receive "alert messages" as warning for a possible disaster that might hit our area.	98	105	54	25	18	**300**	32.67%	35.00%	18.00%	8.33%	6.00%	100.00%
2. I believe that these "alert messages" come from:												
**Authority (PDRRMC, Municipal or City Government, Barangay Council, Purok leader, Police, etc.)	99	94	55	29	20	**297**	33.33%	31.65%	18.52%	9.76%	6.73%	100.00%
**Non-Government Organizations	39	86	87	35	33	**280**	13.93%	30.71%	31.07%	12.50%	11.79%	100.00%
**Forwarded to me by my contact/s	57	92	72	31	29	**281**	20.28%	32.74%	25.62%	11.03%	10.32%	100.00%
**Unknown sender	22	55	76	53	73	**279**	7.89%	19.71%	27.24%	19.00%	26.16%	100.00%
**Others	12	19	40	25	52	**148**	8.11%	12.84%	27.03%	16.89%	35.14%	100.00%
3. The alert messages I received can be trusted.	56	82	97	37	23	**295**	18.98%	27.80%	32.88%	12.54%	7.80%	100.00%
4. I received the "alert messages" on time.	56	74	79	55	26	**290**	19.31%	25.52%	27.24%	18.97%	8.97%	100.00%
5. The reason/s of the delay of the "alert messages":												
**Network down/problem	93	89	65	28	19	**294**	31.63%	30.27%	22.11%	9.52%	6.46%	100.00%
**Unstable signal	91	107	48	28	16	**290**	31.38%	36.90%	16.55%	9.66%	5.52%	100.00%
**Problem/s from the sender	25	107	98	46	29	**305**	8.20%	35.08%	32.13%	15.08%	9.51%	100.00%
**Defective mobile device	42	107	74	54	49	**326**	12.88%	32.82%	22.70%	16.56%	15.03%	100.00%
**Others	14	107	37	22	44	**224**	6.25%	47.77%	16.52%	9.82%	19.64%	100.00%
6. The message of the "alert messages" is clear.	65	107	51	13	8	**244**	26.64%	43.85%	20.90%	5.33%	3.28%	100.00%
7. I do this after receiving the "alert messages":												
**Think of them as a warning so I must prepare	97	107	49	15	17	**285**	34.04%	37.54%	17.19%	5.26%	5.96%	100.00%
**I forward them to other people	93	107	56	23	20	**299**	31.10%	35.79%	18.73%	7.69%	6.69%	100.00%
**I don't care	11	107	47	45	135	**345**	3.19%	31.01%	13.62%	13.04%	39.13%	100.00%
**Others	13	107	25	16	57	**218**	5.96%	49.08%	11.47%	7.34%	26.15%	100.00%
8. I know about PDRRMC and its functions.	93	107	72	14	18	**304**	30.59%	35.20%	23.68%	4.61%	5.92%	100.00%
9. There is a need for the authority to send "alert messages" through SMS to alert people for possible disaster.	142	107	51	6	9	**315**	45.08%	33.97%	16.19%	1.90%	2.86%	100.00%
10. SMS is a useful tool to warn the people for possible disaster.	131	107	51	10	9	**308**	42.53%	34.74%	16.56%	3.25%	2.92%	100.00%
11. The authority should have a dedicated cellular phone number for this operation.	167	107	39	6	7	**326**	51.23%	32.82%	11.96%	1.84%	2.15%	100.00%
12.How effective are the following means in disseminating information about disaster or emergency situation?												
**Radio	139	107	27	9	9	**291**	47.77%	36.77%	9.28%	3.09%	3.09%	100.00%
**Television	211	107	8	9	7	**342**	61.70%	31.29%	2.34%	2.63%	2.05%	100.00%
**Newspaper	60	107	75	27	16	**285**	21.05%	37.54%	26.32%	9.47%	5.61%	100.00%
**Text Messaging (SMS)	95	107	75	21	15	**313**	30.35%	34.19%	23.96%	6.71%	4.79%	100.00%
**Flyers	35	107	86	49	42	**319**	10.97%	33.54%	26.96%	15.36%	13.17%	100.00%
**Community Announcement	171	107	21	5	7	**311**	54.98%	34.41%	6.75%	1.61%	2.25%	100.00%
**Others	11	107	25	6	46	**195**	5.64%	54.87%	12.82%	3.08%	23.59%	100.00%
