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SOCIAL MEDIA FOR CIVIC PARTICIPATION, COMMUNICATION, AND COORDINATION OF DISASTER RELIEF: TWITTER USAGE IN THE PHILIPPINES DURING TYPHOON NOCKTEN

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Abstract

Social media is quickly becoming a preferred channel for information and communication, permeating most aspects of human interaction and bringing both challenges and opportunities. Communication, coordination, and knowledge sharing have become integral features of behavior among online communities in efforts towards finding measures and solutions for common problems in the real world.

This study contributes to the nascent but ever growing body of knowledge that attempts to bridge the viability of social media utilized as tools in aiding disaster mitigation practices. This paper explores significant behaviors in civic participation, communication, and coordination of disaster relief, adopting established approaches for examining the utilization of popular social media platforms such as Twitter, Facebook, and Instagram. The study focuses on Typhoon Nockten and provides an explanation on how social media, primarily Twitter, aided in disaster efforts throughout the course of the storm. Findings revealed that Twitter functioned as an avenue that catalyzed the process of delivering second-hand reports and more as an information outsourcer that make it possible to track the progress of Nockten, and allow for contingency planning that spearheaded recovery efforts. Results also show that civic participation by individuals was evident, as demonstrated by the number and usage of twitter. This paper argues for examination on how social media can be meaningfully utilized not only in terms of logistics but also the underlying sentiment of their messages - particularly more apt in developing countries such as the Philippines, with its ever increasing vulnerability to natural disasters.

Keywords: Natural Disasters, Typhoons, Social Media, Typhoons, Twitter, Nockten

Introduction

Background

Disasters have destructive potential that can disrupt the functions of a community, causing widespread losses that tend to exceed the capabilities of the affected community to cope and respond using their own resources (UN-ISDR, 2003). These losses are most commonly caused by nature, accidents, or by human activities (Penna & Rivers, 2013). A natural event is labeled as a natural hazard when it poses a threat to the lives of people and to the integrity of their property (Hyndman & Hyndman, 2014). Natural hazards become natural disasters when they cause a significant amount of damage to human life and property, it should also still be considered that the severity of disaster can be experienced along gradients of social inequalities, not necessarily evenly applied in the same area according to natural conditions.

The Philippines' climate is tropical, with relatively high temperatures, humidity, and plenty of rain. Rainfall in the Philippines is the most important climatic event for the entire archipelago (PAGASA, 2016). The average annual rainfall in the country varies from 965 to 4, 064 mm; which means that the amount of rainfall the Philippines experience generates water levels that are between three to 13 feet deep. On average, the Philippines also experiences twenty tropical cyclones in a year. The state weather bureau, Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA), classifies these cyclones into five categories (1) Tropical depression (less than 63km/h maximum winds), (2) Tropical storm (62km/h-88km/h maximum winds), (3) Severe tropical storm (89km/h-117km/h maximum winds), (4) Typhoons (118km/h-220km/h maximum winds), and (5) Super typhoons (more than 220km/h maximum winds). Among these cyclones, ten will be typhoons, five of which are likely to become destructive (de la Cruz, 2016).

The Philippines due to its geographical location is also the most exposed country to tropical storms and its islands are especially vulnerable to storm surges (Brown, 2013). It is also among the most disaster-prone countries in the world. A report published by the UN-ISDR and the Center on the Epidemiology of Disasters (CRED) in 2015 ranks the Philippines as being among the top ten countries with the most number of people affected by natural disasters—around 130 million. A report published by CNN Philippines on January 21, 2016 states that natural disasters also quickly stack damage expenses. As an archipelagic country, populations spread across the Philippines are congested in overpopulated areas with a lot of the infrastructures poorly maintained and are not built to withstand extremes in weather. In addition to large quantities of people being displaced, property and structural damage demand millions of pesos to be funneled into recovery goods and services (Santos, 2016).

In relation to this, the Southeast Asian region is expected to experience the worst effects of climate change within the next 30 to 50 years (Southgate, 2015). The main reason being that it will greatly impact labor in the region as most Southeast Asian countries have a big agriculture-based economies and plentiful natural resources that they rely heavily upon. Most of these countries, such as Philippines, Thailand, and Vietnam, are surrounded by large bodies of water, and with heavily populated coastal

areas that have large concentrations of families living under two dollars a day, there is a greater increase in the risk brought about by natural disasters (Southgate, 2015).

During times of disasters, communication channels play a significant role before, during, and even after the events. Traditional media channels can include announcements made on radio, television, newspapers, town criers, and word-of-mouth are the more common means of disseminating updates when disasters happen in a community. However, social media is fast becoming one of the most important channels for communications during these events, augmenting the more traditional communication channels (Takahashi, Tandoc, & Carmichael, 2015). Social media offers a communication channel that is not limited to the affected areas in times of disaster and is accessible to most, if not everyone, in the world. It can become the platform organizations need when coordinating disaster relief (Landwehr & Carley, 2014) and for situational awareness (Vieweg, Hughes, Starbird, & Palen, 2010).

At the same time, it must still be acknowledged that 'while volunteered geographic information via social media such as Facebook and Twitter may empower some citizens to contribute and engage in disaster management, it can also act to marginalize others' (Haworth & Bruce 2015, pp.237-238). Considering the digital divide on the role of citizens with limited socio-economic circumstances or living in parts of the world without access to empowering technologies' is also important (p.244). Particularly for the Philippines, 'national figures indicating increasing internet and social media usage can still however conceal regional differences. Herein, usage of these technologies can still be largely an urban, middle-class phenomenon that highlights digital access divisions' within the society (Madianou, 2015, p.4).

Twitter, a social media platform, is increasingly being used as a communication platform during disasters. In September 2013, Twitter launched its Twitter Alerts service that was based on their Lifeline feature that was deployed in Japan in 2012, post the March 2011 Triple calamities: Great East Japan earthquake and ensuing tsunami and Fukushima nuclear reactor meltdown. It provided a way for users to receive accurate and important information from dependable organizations during emergencies, disasters, or when traditional channels for communications are impossible (Twitter, 2013). The use of Twitter helps in spreading news and information to people in times of earthquakes (Earle et al., 2010)a popular service for sending and receiving short, public, text messages, can augment its earthquake response products and the delivery of hazard information. The goal is to gather near real-time, earthquake-related messages (tweets, floods (Bruns, Burgess, Crawford, & Shaw, 2011) and wildfires (De Longueville & Smith, 2009). As Mims (2010) argues, Twitter functions more as a news service instead of a social network, but the use of Twitter as a news service works *because* of the fact that it is a social network. The platform's limited character count forces the user to compress information into a 140-character post, then combined with its design to route these posts via tags to both specific targets *and* public social connections make Twitter a social news service. In the Philippines, social media such as Facebook and Twitter allows a platform to maintain communication between family members, geographical boundaries notwithstanding. Moreover, 'the intersection between collective coping and social media is salient in the country' (Tandoc & Takahashi, 2016, p.6).

This study aims to answer the question: How is Twitter used in times of typhoons? To aid in answering the research question, the study will incorporate the following investigative questions: What is the frequency and are there differences, in terms of volume, in tweets before, during, and after the typhoon? What is the most common purpose of Twitter users for tweeting during the course of the typhoon? The study then present and analyzed collected Twitter data during Typhoon Nockten, that had caused over 1 billion pesos in damages and the strongest Christmas Day tropical cyclone worldwide in terms of 1-minute sustained winds, and, determine significant relationships between Twitter usage, user types (individual, news organization, government), and types of tweets (original, retweet).

The study covers the use of Twitter during the progress of the Typhoon Nockten (domestically named "Nina"). The data involved is from the period of 19 December 2016 to 11 January 2017, from the time that Typhoon Nockten was detected, entered the country's area of responsibility, until its full exit. Data required will contain the hashtags "NinaPH" and "Nockten". Other general hashtags, such as "Nina" or "typhoon", were omitted to systematically limit very common names and tags utilized in tweets. Subsequent manual verification by a third party encoder was conducted to filter unrelated tweets, spam, or automated tweets by bots. Typhoon Nockten is the chosen case for this study as it is considered as a major storm that caused over 1 billion PHP in damages to the Philippines during the scheduled period of data collection. The data's recentness is considered due to the access restriction of Twitter to archived tweets.

The Philippines currently has an Internet population of 47.1 million, representing 46% of the total population as of 2015 (We Are Social, 2016). Usage of social media during disasters in the Philippines has become relevant and timely, as the Philippines has been named in a 2017 report as the global lead in terms of the time spent on social media. The report showed that 'Filipinos spent an average of 4 hours and 17 minutes per day (17.85% of a day) on social media sites such as Facebook, Snapchat and Twitter, and moreover had a social media penetration rate of 58 percent, higher than the average of 47 percent in Southeast Asia' (Camus 2017). The findings of this study can benefit Philippine society as it is an expanding community of Internet-users, especially in times of calamity. There is a growing need for quick and effective dissemination of reliable information and disaster-readiness in communities in storm-prone countries like the Philippines.

Review of Related Literature

Disaster Risk Reduction

As stated by the United Nations Office for Disaster Risk Reduction (UNISDR) there is 'no such thing as a natural disaster, only natural hazards' (2015). Disasters are the after-effects of natural hazards and the severity of these effects are dependent on the impact of a hazard has on a particular area or community. The scale and magnitude of these impacts, in turn, is dependent on the type of human-environment behavior and interactions that exists within a particular geographic location. Natural hazards originate from the Earth's ever-changing climate and weather patterns, which are

naturally occurring phenomena (Penna & Rivers, 2013); these are potential risks or dangers in the physical environment that have the ability to cause harm, but do not predominantly exist for the sake of purposely causing harm.

Disaster Risk Reduction (DRR) is now an important tool in building more resilient people and communities (UN-ISDR, 2015). DRR, regarded as a discipline, is presented in-depth in Kanta Kafle's 'Disaster risk reduction: case studies from Asia' (2012). Kafle's work is a collection of disaster risk reduction-based research papers that highlights the best DRR best practices and emphasizes the need to focus DRR efforts towards minimizing the vulnerability and building the capacities of communities. Current developments in DRR establish the strengthening and development of effective disaster communication processes and systems. This step forward in disaster mitigation practice calls for the integration of social media into the development of new technologies, techniques, and even policy reforms (Houston et al., 2015).

Contextualizing Climate Change, Extreme Weather Events and Disaster Risk Reduction in the Philippines

One of the most catastrophic events that shook the Philippines was the passing of Super Typhoon Yolanda, internationally named Super Typhoon 'Haiyan'. On 8 November 2013, the Philippines experienced one of the strongest recorded storms in history. Haiyan affected over 16 million people. With sustained wind speeds of at least 314 km/h, coupled with heavy rain and storm surges, the super typhoon had caused over USD 13 billion (PHP 571 billion) in damage and left over 6,000 dead (Remo, 2013). Only in the aftermath of the typhoon was the devastation made clearer - among the hardest hit areas, 90 percent of homes were destroyed; 70 – 80 percent of the areas in the way of the storm, such as Biliran Island, Samar, Leyte, Northern Cebu, and Metro Cebu, were destroyed, with millions of people displaced and left homeless and hungry. It was an event unmatched in scale in recent Philippine history, causing untold damage to both infrastructure and human capital (Mercy Corps, 2013).

However, Haiyan is not the first storm to cause massive damage to the country. On 26 September 2009, Tropical Storm Ketsana made landfall in the North, hitting majorly populated cities including Manila. The Typhoon, boosted by the Southwest Monsoon, had caused flood levels to rise 17 inches in less than 12 hours in the Northern region of the Philippines, enough to submerge cars and make streets impassable. In terms of count, Ketsana affected over 4 million people—killing around 464 individuals and causing USD 2.5 billion (PHP 11 billion) in infrastructure and agricultural damage (Olan, 2014).

It was because of the havoc caused by Ketsana that the Philippine Disaster Risk Reduction Management (DRRM) in the country was legislated and passed into a law. Signed on 27 May 2010, RA 10121, also known as the Philippine Disaster Risk Reduction Management Act of 2010, aims to develop a framework that strengthens disaster management in the country and enables national and local government units to mobilize resources in order to build communities that can better survive disasters (Rey, 2015). The overall goal of DRRM practice in the Philippines is to not only build resilience against natural disasters, but also uphold environmental integrity; increase

disaster preparedness and response; and to better disaster recovery and rehabilitation (NDRRMC, 2011). The National Disaster Risk Reduction Management Plan (NDRRMP) of the National Disaster Risk Reduction Management Council (NDRMMC) is a plan that serves as a framework on how achieving sustainable development through inclusive growth includes the building of communities that are adaptive, capable, and resilient. The most vulnerable sectors are molded in such a way that they are made to be able to survive extreme weather events by optimizing disaster mitigation opportunities (NDRRMC, 2011).

Social Media and Twitter

Social media is defined by Kaplan and Haenlein (2010) as a group of internet based applications that are built on the 'ideological and technological foundations of Web 2.0'. Essentially, this means that content and applications are not created and published by just one person and is instead continuously modified by users in a collaborative and participatory way. Social media allows for the construction and exchange of User Generated Content (USG). This enables people to share USG in a more dynamic manner, with more room for feedback and participation, as compared to passive viewing of static content such as those in print media or earlier found in internet-based information sites. This definition is further expanded by Cohn (2015), as the usage of web-based and mobile technologies to communicate and to turn this communication into an interactive dialogue between people. Nevertheless, it must still be acknowledged that although 'usage of social media such as Facebook and Twitter allows for coping mechanisms within the post-disaster environment, due to the fact that these uses are steeped in already existing asymmetrical relationships within the Philippines and globally, they potentially entrench dependencies to powerful others'(Madianou,2015, p.9). As such, it is also vital to take into account the potential of opaque and non-democratic security, privacy, and commercial issues of social media platforms.

There has been growing interest towards discussing the use of social media in terms of crisis management, exploring the viability of social media as an effective communications tool, indicative about the many strengths and benefits of social media as a broad platform or avenue for communication (Alexander, 2014). Moreover, communication is a core component of disaster preparedness; effective communication can dampen the effects of a disaster, whereas ineffective communication runs the risk of worsening it. Houston et al. (2015), for instance, had developed a framework that illustrated several uses of social media for disasters as well as corresponding phases during a disaster.

In research conducted by Huang, Chan and Hyder (2010), they explored the usage of social media during the typhoon Morakot in Taiwan in 2009. The information that local government of Taiwan had in regards to the communities, actually lagged behind news organizations and NGOs in regards to information about communities that were affected by the typhoon. They found that the usage of internet based social platforms and mobile communications, can alter the interactions of the government and communities in a positive way during disasters, and argues for a system that allows people to use mobile phones or laptops to report occurrences so that the government

can perform search and rescue operations better. By employing these technologies, governments would then be able to revolutionize how they help people respond and recover from these events (Huang, Chan & Hyder (2010). In the Philippines, Tandoc and Takahashi (2016) conducted a qualitative study exploring the use of Facebook for collective coping in the immediate aftermath of Typhoon Haiyan. In this case, 'social media allowed the enactment of strategies of collective coping amid the breakdown of traditional communication platforms' (p.12).

As part of the Web 2.0 phenomenon, Twitter had gained prominence as a social networking and micro-blogging service with a total of about 313 million active users (Twitter, 2016a), it was developed in 2006 by Evan Williams, Biz Stone, and Jack Dorsey (Strickland & Chandler, 2014). First described as the 'SMS of the Internet' (Dijck, 2011), Twitter enables users to generate content in the form of 'tweets', messages that at first, were limited to only having text that had a maximum of 140 characters, but now, can include photos, videos, and/or links (Twitter, 2016b). Twitter is largely chronological and enables real time transmission of information to a group of users (Mendoza, Poblete, & Castillo, 2010). Twitter messages are public; however, users can opt to be 'protected' thus limiting the reach of their tweets to only approved followers.

Twitter and Disasters

Natural disasters create circumstances that require information to be distributed efficiently, in a timely manner, and to targeted audiences (Spence et al., 2015). Social media outlets can provide avenues for eyewitnesses of events to report what is happening in real time. By employing hashtags (#)[1], Twitter users generate a live stream of tweets that are clustered together around specific events (Lee, Ybañez, De Leon, & Estuar, 2013)but data quality issues in organizations are often addressed inadequately and pertinent Data Governance (DG. This gives people access to enormous information during disasters or emergencies that is published online by multiple users (Simon, Goldberg, & Adini, 2015). Also, Schultz, Utz, and Göritz, (2011) found that the medium that is used actually mattered more than the message. With the use of Twitter, sent information garnered less negative reactions compared to the reactions of people when information is spread through traditional media.

The mobility of Twitter is seen to be especially useful in times of emergencies and crises wherein the brevity and condensed form of information that are tweets, take up less time to create and send, as compared to other social media applications have more features but utilize more internet bandwidth resources. The fact that Twitter also makes use of hyperlinks—links that can lead a user to a news story, to a video, etc., in other social media platforms can create a more substantive understanding of what is happening (Soriano, Roldan, Cheng, & Oco, 2016). Furthermore, Twitter

1 The pound sign (#) symbol alongside a word or a phrase is now termed a 'hashtag' and allows users to put their tweets into categories using the hashtag-marked words like keywords, allowing users to find related tweets without having to follow the original poster or all other users under that topic (Twitter, 2016b).

has a relatively simpler privacy setting and interface compared to other more robust multimedia or customizable platforms, as such, with its straightforward design and functionality, tweets can easily be viewed by anyone, as long as the user has set their profiles as public. This leads to a better diffusion of information (Bruns et al., 2011).

Murthy (2011) touched on the capacity of social media, such as Twitter, to give rise to citizen journalists capable of tweeting at a moment's notice on their mobile phones, which often includes photographic documentation. Murthy (2013, pp. 70-91) further expands this by saying that citizen journalists have gone on to update the world about earthquakes, tsunamis, and other disasters on Twitter. Individuals use Twitter in order to follow breaking news and to keep up with the updates that may come up. Moreover, the ability of individuals to post or tweet about their experiences during and in the aftermath of disasters creates the potential for marginalized people to update the world about what is happening to them.

Despite this, it is still acknowledged that there are possible drawbacks that exist in employing the use of Twitter during disasters. It is very likely that only well-connected countries with fast internet connection speeds and wider network coverage can actually update the world about their statuses, while less connected countries have to rely on other countries to spread the knowledge of what is happening and has happened (Murthy, 2013). Moreover, in a study by Nagar, Seth and Joshi (2012), it was found that despite the fact that news about disasters comes from different places in the network, it eventually reaches a community that is interested about news of the disaster and that this community eventually isolates itself by becoming disconnected to the wider world of the Twitter platform.

Twitter and Typhoons in the Philippines

In the case of the Philippines, according to Montecillo (2012) the country is recognized as one of the social media capitals of the world. In his post, the Philippines in 2012 ranked 10th among the list of countries that use Twitter, and that of Twitter's estimated 517 million total (active and non-active) users, 9.5 million are Filipinos.

Several studies have been made that measure the use of social media in times of disasters. For instance, Fraustino, Liu, and Jin (2012) included in their report evaluations on the influences of social media, and discuss factors that might lead to either active or passive use of social media in times of disasters. Herein, social media use was categorized into groups, the significance of which was to be able to more effectively gauge the level of social media consumption that allowed the authors to pinpoint what functions and motivations users had in using social media and how it affected user behavior in the event of natural disasters.

In another study by Takahashi, *et al*. (2015), an analysis of the tweets that were sent was presented. They took a sample of tweets from the hashtag of #PrayforthePhilippines, #Haiyan, #ReliefPH, and #YolandaPh from the period of six days from 8 November 2013 to 13 November 2013. The results of the analysis showed that Twitter users, whether they were affected by the storm or not, used Twitter primarily as a means to (1) report second hand updates, (2) memorialize victims by tweeting in a way that remembers and/

or honors, (3) coordinate relief, (4) post personal updates or (5) criticize the government. Second hand reporting actually made up a majority of the tweets at 43.4 percent, with victim memorialization and relief coordination as second and third respectively.

Using Typhoon Haiyan as another case study for Twitter, Athanasia and Stavros (2015), analyzed nine consecutive days of tweets and compared them to actual events. The results indicated that Twitter users during disasters tended to post or tweet in order to enhance awareness regarding the situation in the area and also to encourage other people to act in response to the event. Moreover, they have found that the tweets that were posted were reliable and able to provide relevant and valuable information about the typhoon and its effects to people.

Typhoon Haiyan triggered global media attention and humanitarian action. David, Ong and Legara (2016) showed in their paper that conversations on Twitter about disasters evolve over time, which shows an issue attention cycle on the platform. They also performed content analysis that showed that the majority of the tweets actually contain information about the typhoon, the damage it has caused, and disaster relief activities. Differences in type of tweet was also analyzed, and the results showed that original tweets are more likely than not to come from individual twitter users and are mostly messages of support to victims, of emotional reactions, and criticisms of the government. Tweets that are most often retweeted usually come from official sources and information hubs like news networks, humanitarian organizations, and others. Also, while looking at original tweets from individual users, it was shown that Twitter is being used as more than a site for information dissemination, but also for relief activities.

It now seems that social media–particularly Twitter, with its relatively straightforward interface and functionalities, while having low technical specification and internet resource requirements as opposed to other websites and platforms,–has become a tool that aids crisis management and the practice of disaster and risk reduction. More about this aspect of social media is expounded on in a study by Ludwig, Siebigteroth, and Pipek (2015). Their study circulated around the idea of 'crowdsourcing'—online participatory activities of an individual or group of people proposing to another group of individuals to the voluntary undertaking of a task—in which case, social media was utilized as a gateway for crowd-sourced information in aiding the deployment of emergency services and in addressing critical situations.

Social media's vast potential is limited by the fact that online access and connectivity plays a very big part in its operations. The problem here lies in the reality that not all countries have stable or reliable access to the Internet, let alone total coverage for its entire population. Madianou (2015) discusses in his work on how social inequalities can bring about the existence of a digital inequality; social stratification creates instances wherein difference in living standards and social classes leads to the compounding of coordinating action towards alleviating disaster scenarios. Madianou also expounds on the relevance of using big data, made possible and easier by the introduction of social media, to aggregate possible government interventions during crises, but also elaborates on the negative aspect of some big-data sources as being unequally distributed.

Framework of the Study

Narrative Discussion of the Framework

This framework illustrates the role and relationship of social media in crises minimization during typhoons. The framework for analysis is based on a study conducted by Soriano *et al*. (2016) that highlighted Twitter as a catalyst for civic engagement during Typhoon Yolanda, building on the premise of Twitter as a form of participatory media—that is, users do not only consume media, but also create and distribute it. Likewise, a growing user base allows for broader communication and coordination, contributing to a network system created for the sake of disaster mitigation. As depicted in Figure 1, this process of information gathering, sharing, and the subsequent actions taken based on said information is cyclical, and at the center of it all is social media which acts as an arbitrary factor that affects the other three.

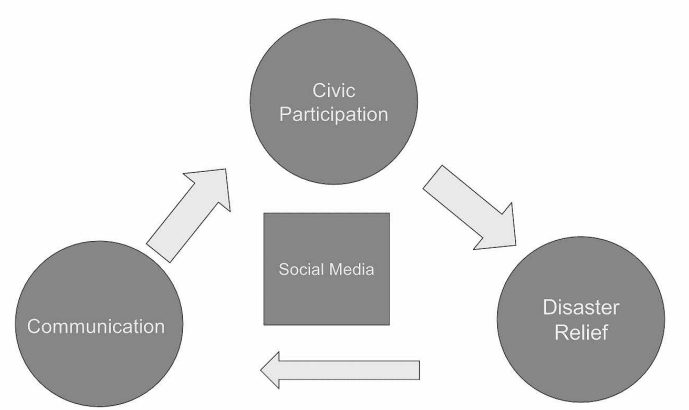

Figure 1: Visual Representation of Framework.

Implications

Applying the framework to social media – social media, preferably network sites such as Twitter and Facebook, can shape the way people or even organizations behave and/or operate; in turn, the patterns now exhibited by these groups and individuals influence the way social media is used and integrates itself into the day to day lives of people.

In the context of Twitter, it can be argued that more people can eventually use Twitter as Internet connectivity and network coverage grows. With the increased patronage of Twitter, more people will have access to creation and sharing of both knowledge and information through interactions made possible via tweets.

Ideally, this framework brings about participation from people during disasters. The implication is that the magnitude of Tweets would be largely at the end of a disaster in order to account for the rise in relief efforts and relief coordination, while the fewest would be during the event itself.

Methodology

Data and Collection Procedure

This study adopts a quantitative approach with data in the form of tweets that were made from December 24, 2016 to January 11, 2017 and under the official hashtags of the storm. The total number of tweets collected and analyzed for this study is 11,970 tweets, which is a filtered amount guided by the five emergent categories of tweets as identified in the literature review.

To be able to obtain the required quantitative data, the tweets that this study worked with were under the hashtags "NinaPH" and "Nockten" and were posted from the period of December 19, 2016 to January 11, 2017. The main method of data collection was via the NCapture program—a specialized browser extension tool developed by QSRInternational that can capture content, like tweets and web pages, and converts them into workable datasets. Using the NCapture tool, the items collected were filtered under the given hashtags and searched through the Twitter website. Although it is possible to collect the tweets manually using Twitter's built-in search function in its site graphical user interface, doing so would needlessly take an enormous time and would also risk having relevant tweets disappear as not all tweets are archived permanently.

Once the tweets were acquired, encoding of data was done using computer assisted qualitative design analysis software (CAQDAS) - the NVivo program[2]. Once NCapture had finished gathering all the required Tweets, the databases were imported to NVivo, upon which tweet data was then segregated into user tweet preference obtained by using pre-defined options derived from the literature. A program-unique classification system called "coding" was used in segregating tweets into themes that would produce observable trends or patterns. After the coding process, and cross-validation by another encoder, the consolidated dataset was analyzed.

Analytical Techniques Procedure

For general data, meaning frequency, or count of the number of tweets, the first analytical technique is to employ the use of tables and graphs. Because the amount of tweets was too big for a frequency distribution table (FDT), a specialized table or matrix was used instead. Upon segregation of tweets into the five (5) categories as provided for by the review of literature, in order to answer the research question a chi-square goodness of fit test has been used in order to gauge the relationship between the specific purpose of tweeting and the corresponding tweet count. Another chi-square test was also employed to determine level of relationship between the garnered tweets corresponding to each category.

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2 NVivo is a research program developed by QSR International that aids in the classification, sorting, analysis, and management of collected data (QSR International, 2016)

Investigative Questions	Data	Data Source	Data Gathering Technique	Data Classifications	Data Encoding and Analysis
1. What difference, in terms of volume, are there in tweets before, during and after the typhoon?	Number and content of tweets relevant to #NinaPH	Twitter	NCapture Browser Extension Tool	None	NVivo and manual univariate statistical tests
2. What is the most common purpose of Twitter users of tweeting during the course of the typhoon?				1. Report second hand updates 2. Memorialize victims 3. Coordinate relief 4. Post personal updates 5. Criticize the government	NVivo and multivariate statistical tests

Figure 2: Summary Data Map.

Table 1: Descriptives.

Type of Tweet		
	Tweet	5610
	Retweet	6360
	Mean	2394
	Median	1662
	Mode	None
	Variance	54120.5
	Standard deviation	233
	Skewness	10.27
	Kurtosis	1.04

Type of User		
	Individuals	7789
	News Groups	901
	Government Organizations	3280
	Mean	3990
	Median	3721
	Mode	None
	Variance	3082644.5
	Standard deviation	1756
	Skewness	2.27
	Kurtosis	1

This study benefits greatly from the assistance of computer software and the use of descriptive statistics to clearly show the relevance and distribution of data. Table 1 shows the descriptive statistics for the datasets of the type of tweet and the type of user. The high levels of skewness are most likely the result of outlier mean values due to the size of the dataset (Agresti & Finlay, 2009).

Data Analysis and Discussion

The research question wants to determine how Twitter was used when Typhoon Nockten struck the Philippines. User types were broken down into three main categories: Individuals, News Groups, and Government Organizations (GOs). A chi-square analysis revealed that there was a strong association between user type and the nature of the tweets they post. Individual users tend to post a lot of second-hand reports, which was 32.5% (3895) of the total amount and relief coordination, which was 21.7% (2597) of the total amount. For Individuals, News Groups, and GOs, second-hand reporting added up to 6200 tweets which made up 51.8% of the total amount collected, indicating that twitter was most probably used as an avenue to hasten the dissemination of typhoon-related reports. Following second-hand reporting is relief coordination at 3721 tweets, which is 31.1% of the total, followed lastly by memorialization by remembering or honoring the victims at 2045 tweets, which is 17.1% of the total. These values were not too far off from what was expected, as the primary objective when a strong typhoon hits is to minimize damage and casualties, thus prioritizing preparedness and safety - reporting second-hand information allows for information sharing regarding critical aspects about the approaching disaster, while relief coordination allows for a faster response. Memorialization was the least used for this particular case because it primarily catered to positive reinforcement for those affected.

As such, these results share similarities to the findings made by Takahashi and Tandoc (2016) with Facebook, wherein social media provides a ‘means participation in the social construction of experience’ and ‘’becomes a venue to manage their feelings and memories by documenting—and memorializing—what was experienced’ (p.8).

Table 2: Results – User Type and Use.

	Coordinate Relief	Second-hand Reporting	Memorialize
Individuals	2597	3895	1297
News Groups	100	576	225
GOs	1024	1733	523

Table 3: Exemplary Tweets by Use - Before, During, and After Typhoon Nockten

	Before	During	After
Coordinate Relief	1. @AbainzaRalph: Here are the areas that may be affected by #NinaPH this Christmas Weekend. Note: This may still change. Please be prepared. 2. Atm.. PDRA Meeting re STS #NINAPh (Nock-Ten) Preparations. 3. RT @dswdserves: Sec. Judy's call for Bayanihan on the onset of TS Nina this coming Christmas season.	1. RT @philredcross: Red Cross on high alert for Typhoon Nina, setout volunteers and equipments https://t.co/WyAEr1Ciel #NinaPH 2. We're praying for #Philippines esp those who've had to flee their homes, as #Typhoon #Nockten #NinaPH approaches https://t.co/KijmtblpXI 3. RT @CBMworldwide: In contact with staff & partners as #Typhoon #Nockten #NinaPH nears Philippines	1. @philredcross: NOW: Shoes distribution to 351 students at Bognuyan National High School. 2. ACTED teams are mobilized in the field to respond to typhoon #NinaPH #Nockten in the Philippines: check out ACTED's map of intervetion! 3. Relief goods for bicol region @raineemma169 @itsmelow @EbonniePua #DeucersCare #NinaPH #DiPuroPartyMagCharityDin
2nd Hand Reporting	1. RT @cnnphilippines: PAGASA: #NinaPH expected to hit Metro Manila on Monday. 2. @CindyHarvard: Is there a storm? #NinaPH #ALDUBBubbleWorld 3. AGASA: #NinaPH expected to hit land over Bicol region on Sunday afternoon @cnnphilippines	1. @PhilippineStar: WEATHER UPDATE: Catanduanes now under storm signal no. 3 due to #NinaPH | @dost_pagasa https://t.co/leDwRAh9xo 2. RT @ABSCBNNews: CamSur evacuates nearly 48,000 residents as typhoon #NinaPH approaches https://t.co/Ys1MES0zFD https://t.co/0tub54goDL 3. Signal #1 has now been raised here in Metro Manila due to #NinaPH (international name: Nock-ten).	1. @VPPilipinas: VP @lenirobredo visits Sta. Cruz, Marinduque where #NinaPH damaged a gov't hospital and flattened houses to the ground. 2. [FIRST ON TWITTER]Fuentebella talks about power restoration in #NinaPH affected households: Power restored to 76%. (via @rapplerdotcom) 3. @WorldVision: #NinaPH destroyed more than 70K homes in the #Philippines.
Memorialize	1. A CHRISTMAS PRAYER CAMPAIGN FOR NINA. Let us all pray for everyone's safety this Christmas Day. #NinaPH https://t.co/LLK7lB7AjM 2. Lord, I pray for Ur mercy,grace and protection upon our countrymen in the Bicol region as we all brace for the coming of typhoon #NinaPh 3. so everything was ruined huhu #NinaPH	1. #NinaPH please be good to us. In jesus name, amen & #MerryChristmas 2. To all who are planning to give me gifts this Christmas, please just give them to those who will be affected by #NinaPH. Thank you! 3. @krizzy_kalerqui: Just when you thought 2016 could not get any worse: May parating na bagyo sa araw mismo ng Pasko! #NinaPH #inthenews	1. RT @TheWatchers_: Supertyphoon "Nock-Ten" leaves at least 7 dead, 18 missing https://t.co/wCabpm6846 #NockTen #NinaPH #SuperTyphoon 2. As we begin a new year, let us continue to spark hope for families seeking a fresh start after #NinaPH #PLDTSmartFoundation #TulongKapatid 3. Dessa, 8, is excited to return to class next week. But, she is also worried. Her house & all her things were damaged by Typhoon #NinaPH

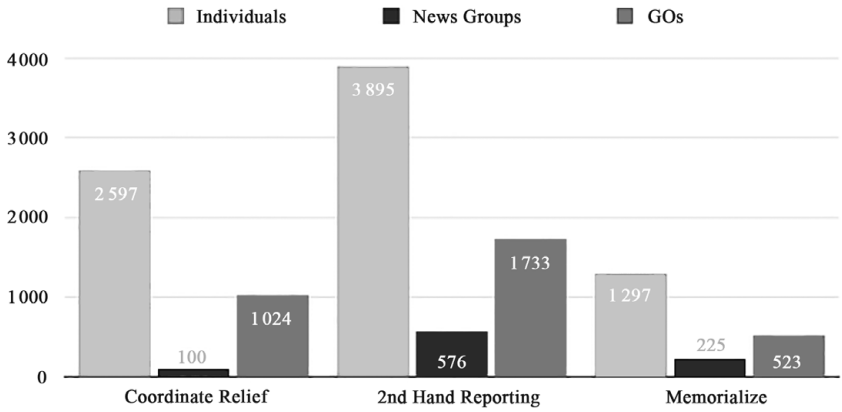

Figure 3: Results – User Type and Use (bar graph).

News groups and GOs yielded a lower percentage of the tweets collected because of the higher user-base for individuals. Though not necessarily a deciding factor, the share of the category of users aid in determining the level at which information is shared as well as the reliability of said information. While most tweets, whether tweets or retweets, came from the general public, it could be surmised that the information they shared came from other sources such as government accounts or updates from civic groups and non-government organizations. Table 3 shows some of the exemplary tweets for relief coordination, 2nd hand reporting, and memorialization that were made before, during, and after the typhoon.

The first investigative question of this study is to ascertain a difference in Twitter activity throughout the course of the typhoon. Three (3) different time periods were observed to determine how many tweets were posted during those particular periods, regardless of purpose. Before Typhoon Nockten made landfall, tweets posted were at 30.2 percent (3615). The highest number of tweets was made during the storm at 54.1 percent (6479). However, this value might be influenced by the fact that a majority of these tweets were made by those not directly affected, or those due to those who are within the critical range of the typhoon being unable to do so due to connection issues. Whether this influx of tweets is driven by sentiment or genuine concern for the affected, it is evident that at this point, Twitter has highlighted its ability to call for social action. Lastly, tweeting in the aftermath of Typhoon Nockten only garnered 15.7 percent (1879) of the total collected amount. Though it may be due to issue obfuscation, or the loss of interest to the event in exchange for other new, trending, or salient topics in Twitter, this could be also possibly attributed to a quicker response by local government units as well as action by the newly appointed administration, learning from the errors committed in relief delivery from Typhoon Haiyan. Conversely, damages from the storm would also hinder immediate updates from those within the affected area. It would therefore not be surprising to see a decrease in twitter activity if one looks at the time period immediately after the event.

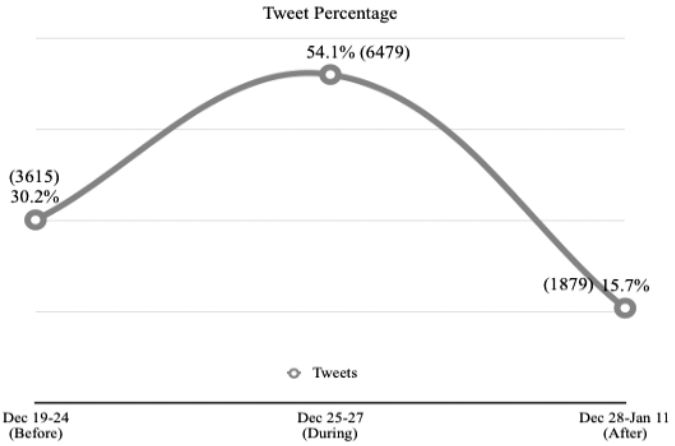

Figure 4: Results – Type of Tweet Use.

The second investigative question aimed to determine what the most common purpose Twitter users had for tweeting. The data had been segregated into two sections: Tweets and Retweets. There were 2,377 tweets related to coordinating relief while 2,108 tweets were about second-hand updates. Retweets garnered 2,000 for coordinating relief, while retweets about second-hand updates were at 2,360. Based on the data analysis, the percentage of Tweets and Retweets are similar in magnitude to the percentage of usage. However, a chi-square analysis yielded a p-value lower than the appointed alpha of 0.05, rejecting the null hypothesis, thus accepting the alternative, that the purpose and type of tweet is not dependent on each other. The type of tweet does not influence the purpose for tweeting. Thus, the most common purpose of users for tweeting is to post about second-hand updates.

Adding both tweets and retweets under second-hand reporting sums up to 4,468 tweets. This result gives an idea about the criticality of individuals or even groups to release and spread information regarding possible and accomplished actions about the passing typhoon. Disaster preparedness entails considerable preparation for an

Table 4: Results – Type of Tweet and Use

	Coordinate Relief	Criticize Government	Memorialize	Personal Updates	Second-hand Reporting
Tweets	2377	385	739	1	2108
Retweets	2000	761	923	316	2360

Note: $x^2(4) = 458.2393579$, $p > 0.05$. Reject null hypothesis. There is a weak association between Tweet type and usage.

incoming disaster. These preparations include monitoring of the meteorological patters associated with the typhoon, contingency planning, resource mobilization, and logistics, among others. As such, when and after such an anticipated circumstance occurs, communication plays a very big role in aiding the affected get back on track to operating and living normally. But due to the lack in clarity concerning the reason more people who are not affected tweet about the typhoon, further exploration of social media use based on location and user-benefit might be required.

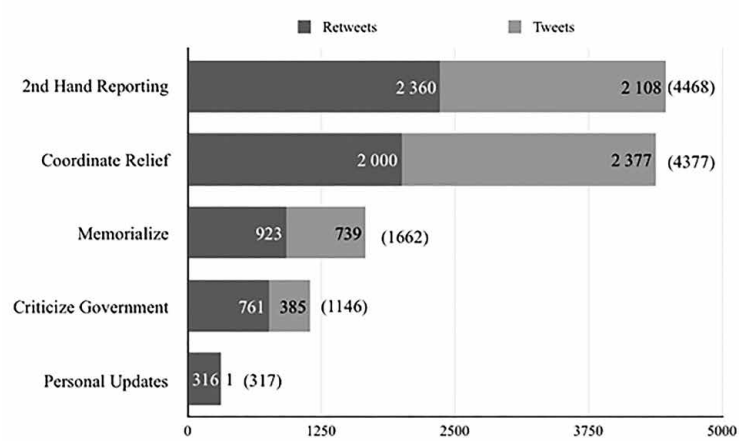

Figure 5: Results – Type of Tweet and Use (bar graph).

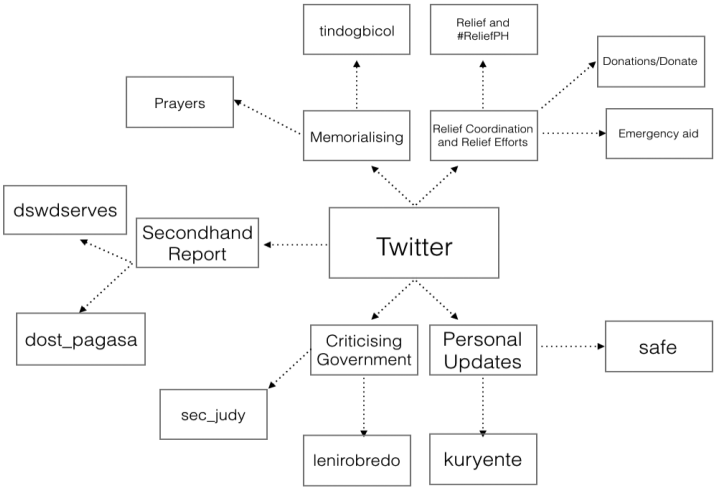

Figure 6: Coding Matrix.

Conclusions

The primary focus of this study was to examine Twitter usage during Typhoon Nockten. As data revealed, the primary reason for tweeting was to share second-hand updates by individuals. The tweets being posted were mostly information about the typhoon, as well as relevant actions or steps taken in order to immediately help those affected—such as reports of emergency funds disbursement and the provision of aid through donations. The sharing of second-hand updates not only aimed to spread awareness of the disaster and its detrimental effects, but more importantly, helped direct action towards effective disaster relief by quickly disseminating information.

This study adopted similar methods and observes comparable findings with a previous study done on the use of Twitter and social media during Typhoon Haiyan (Takahashi et al., 2015), and determined a variation in the purpose and usage of Twitter when the more recent Typhoon Nockten hit the Philippines. Although Nockten was not as destructive as Haiyan, fruitful examination was conducted on the usage of Twitter as a tool that could aid in disaster relief, as well as the viability of Twitter as a platform for emergency communications outside the domain of traditional communication channels.

In examining the data utilizing the framework of this study, it can be surmised that social media has the ability to influence the dynamics of civic participation and communication when it comes to disaster mitigation practices during the event of disasters. The analysis reveals that individuals participated the most as compared to other types of users, and utilized Twitter that allows for communicating current information, expressing concern for victims, criticism of government, and coordination of efforts. As such, this paper adds to the burgeoning discussions on how social media allows people a participatory avenue for receiving and sending information. Twitter, in particular with its straightforward functionality, provides individuals and groups a tool by which the coordination of action and response as well as the dispersal of second hand information are culminated.

Through social media, people and their networks grow and become responsive to situations that would threaten the integrity of both life and property. Efforts are thus funneled towards minimizing possible damage, or to at least aid in quickening recovery, hence influencing the rate at which people participate. The number or frequency of tweets in a particular time frame of the specified typhoon, or any typhoon in particular, can be considered as a local indicator of disaster preparation and response when viewed together with their usage over the duration of the event. High frequency of damage reports, complaints, or pleas of help may indicate a need to improve corresponding preparedness and response in an area.

Interestingly, if it were only the affected area that would be interested or concerned enough about Typhoon Nockten, then results of this study seems counterintuitive as the most number of tweets was during the storm. Because if only those directly affected would be engaged in social media, it would be assumed that the most number should be after a storm has past as these tweets would be focused on directing relief and response efforts to disseminate aid and begin recovery in severely hit areas. Likewise, tweeting during a typhoon would have the least activity as people would prioritize

safety over using social media and that connectivity and internet service in affected areas would most likely be unavailable. However, unlike shortwave radio or local broadcast stations, Twitter is broadcast worldwide and thus increases the capacity to not only contribute to awareness to a passive audience, but also elicit participation from the wider world in coordinating relief and donations, and even voice out criticism by concerned individuals.

There is potential in furthering this area of study as Southeast Asia is home to a growing demographic of social media users. Situated within the monsoon region and coupled with the fact that Southeast Asia ranks among the highest social network usage in the world, there is tremendous opportunity to explore the functions of interactive platforms such as Twitter in aiding citizens during natural disasters. Moreover, it also worth considering how this form of civic participation and resultant attitudes and behavior, can affect individuals, communities, and institutions. The online data from the region provides a rich and diverse source of information, and future studies can be more meaningful with the consolidation of cases from underdeveloped, developing, and developed countries together with DRR techniques – towards an appreciation of social media integration contributing to better disaster preparedness, response, and recovery.

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