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# The use of social media within nonprofit platforms

Can they increase the speed and  
efficiency in the resolution of crises and  
emergencies than using traditional  
means?

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## **ABSTRACT**

This research paper analyses the use of social media within nonprofit platforms that monitor natural disasters, epidemic and political crises.

The first chapter of the research paper is dedicated to the literature review regarding social media, social networks (Twitter, Facebook) and the phenomena of crowdsourcing and word of mouth communication.

The second chapter analyzes the Ushahidi platform and then, through the use of two case studies (Haiti earthquake and Libyan civil war), we test the hypotheses that social media increase the speed (H1) and the efficiency (H2) in the resolution of a crisis in comparison to traditional means.

The research paper ends with the description of the different limitations, managerial implications, and suggestions for further research.

**KEYWORDS:** nonprofit, hFOSS, crisis management, Ushahidi, WOM, crowdsourcing, social media, Twitter, Facebook, IT

## **RÉSUMÉ**

Ce mémoire de recherche analyse l'usage des réseaux sociaux dans les plateformes nonprofit qui monitorent les catastrophes naturelles, les crises épidémiques et politiques.

Le premier chapitre du mémoire est consacré à la revue de la littérature concernant les médias sociaux, les réseaux sociaux (Twitter, Facebook) et les phénomènes de *crowdsourcing* et *word of mouth communication*.

Le deuxième chapitre analyse la plateforme Ushahidi et puis, grâce à l'utilisation de deux études de cas (séisme en Haïti et la guerre civile libyenne), nous vérifions les hypothèses que les médias sociaux augmentent la vitesse (H1) et l'efficacité (H2) dans la résolution d'une crise par rapport à les moyens traditionnels

Le mémoire de recherche termine avec la description des différentes limitations, des implications managériales et des suggestions pour de nouvelles recherches.

**MOT CLES** : nonprofit, hFOSS, la gestion des crises, Ushahidi, WOM, crowdsourcing, médias sociaux, Twitter, Facebook, IT

## **ABSTRACT**

Questa tesi analizza l'uso dei social media all'interno di piattaforme nonprofit che monitorano disastri naturali, epidemie o crisi politiche.

Il primo capitolo della tesi è dedicato alla literature review riguardante i social media, i social networks (Twitter, Facebook) e i fenomeni del passaparola e del crowdsourcing.

Il secondo capitolo analizza la piattaforma Ushahidi e poi, attraverso l'uso di due casi studio (il terremoto di Haiti e la guerra civile in Libia), testiamo le ipotesi che i social media aumentino la velocità (H1) e l'efficienza (H2) nella risoluzione di una crisi rispetto ad un mezzo tradizionale.

La tesi si conclude con la descrizione delle diverse limitazioni, delle implicazioni manageriali e alcuni suggerimenti per ricerche future.

**PAROLE CHIAVE:** nonprofit, hFOSS, crisis management, Ushahidi, WOM, crowdsourcing, social media, Twitter, Facebook, IT

*This research paper is dedicated to my parents and my friends.  
Thanks also to Professor A. Kaplan for the precious advices he gave me.*

# Table of Contents

- INTRODUCTION**..... 8
  - Content of the research and analysis objective..... 8
  - Methodology of the research..... 8
  - Literature Review ..... 9
- CHAPTER 1**..... 12
  - 1.1 Social media..... 12
  - 1.2 Social Networking Sites ..... 17
    - 1.2.1 Twitter..... 18
    - 1.2.2 Facebook..... 22
  - 1.3 Cross boundary collaboration..... 24
  - 1.4 Word of mouth ..... 30
  - 1.5 Hypotheses ..... 35
- CHAPTER 2**..... 38
  - 2.1 The role of ICT in crisis management..... 38
  - 2.2 Ushahidi..... 41
  - 2.3 Haiti earthquake ..... 52
  - 2.4 Libyan civil war..... 58
- CHAPTER 3**..... 68
  - 3.1 Hypotheses verification..... 68
  - 3.2 Limitations and issues regarding Ushahidi and social media..... 70
    - 3.2.1 Verification and truthfulness of information ..... 70
    - 3.2.2 Information overload and technical problems ..... 73
    - 3.2.3 The majority of Ushahidi’s deployments are focused on high profile cases ..... 76
    - 3.2.4 Social media may stop revolutions ..... 79
  - 3.3 Conclusions and managerial implications ..... 82
- BIBLIOGRAPHY** ..... 86
- WEB SITES** ..... 93

# Figures and Tables Index

- Figure 1.1.1:** The honeycomb of social media..... 13
- Figure 1.1.2:** Hierarchy of Needs in Online Communities ..... 16
- Figure 1.2.1.1:** Information flow’s model with the use of @ ..... 21
- Figure 1.2.2.1:** The continuum of implicit and explicit identity ..... 23
- Figure 1.3.1:** The three modalities of XBC ..... 26
- Table 1.3.2:** The six vectors of a generic network\_ ..... 27
- Figure 1.3.3:** The grassroots network ..... 28
- Table 1.3.4:** The eight features to include in a playsource system ..... 29
- Figure 1.4.1:** The WOM matrix ..... 31
- Figure 1.4.2:** Network ..... 33
- Figure 1.4.3:** The cellular automata process\_ ..... 34
- Figure 2.2.1:** Map of Ushahidi’s projects ..... 42
- Figure 2.2.2:** Ushahidi’s user interface ..... 43
- Figure 2.2.3:** The reports page ..... 45
- Figure 2.2.4:** The page to fill the form ..... 46
- Figure 2.2.5:** The get alerts page ..... 47
- Figure 2.2.6:** SMS reporting and feedback cycle in Ushahidi ..... 48
- Figure 2.2.7:** Ushahidi’s dashboard ..... 50
- Figure 2.2.8:** Ushahidi’s badge packs ..... 51
- Table 2.3.1:** Summary of the last four disasters in Haiti\_ ..... 53
- Figure 2.3.2:** Ushahidi-Haiti map ..... 54
- Figure 2.3.3:** Sources of Ushahidi reports during the month of January ..... 57
- Table 2.3.4:** Estimated rates of overall categorization error ..... 57
- Figure 2.4.1:** The Libya crisis map ..... 60
- Figure 2.4.2:** Libya crisis map information flow\_ ..... 62
- Figure 2.4.3:** Evacuations points ..... 65

**Figure 2.4.4:** Timeline of reports submitted ..... 66

**Figure 2.4.5:** Report’s sources ..... 66

**Figure 3.2.1.1:** Term clouds ..... 72

**Figure 3.2.2.1:** Social media during the 4 stages of crisis ..... 74

**Figure 3.2.2.2:** Twitter is over capacity ..... 75

**Figure 3.2.3.1:** Ushahidi reports by region ..... 77

**Figure 3.2.3.2:** Reports per thousand persons ..... 77

**Figure 3.2.3.3:** Mobile Coverage in Haiti ..... 78

**Figure 3.2.4.1:** The state, centralized media and citizens ..... 80

**Figure 3.2.4.2:** The state and citizens in the absence of media ..... 80

# INTRODUCTION

## Content of the research and analysis objective

“Information in a crisis is a patchwork of sources. You can only hope to build up a full picture by having as many sources as possible” (Okolloh, Ory, 2008, pg65)

Ory Okolloh is a Kenyan activist, blogger, and lawyer. She is also one of the founders of Ushahidi, a nonprofit platform. Her sentence is behind the founding idea of this research paper, which aims to analyze the use of social media in nonprofit platforms.

The major role of these nonprofit platforms is to monitor natural disasters, epidemics political crises, and wars.

The objective of the analysis is, thus, to demonstrate empirically that social media in nonprofit platforms increase the speed (H1) and the efficiency (H2) in the resolution of a crisis in comparison to traditional means.

For a better understanding of our objective, we clarify what we mean by speed and efficiency:

- *Speed*: how fast the crisis is discovered, the amount of time necessary to deploy the rescue teams and the time to reach the crisis’ resolution in comparison to traditional means.
- *Efficiency*: the importance and the truthfulness of information provided and the percentage of their usefulness in the resolution of a crisis.

## Methodology of the research

The research presented is:

- *Analytical*: it investigates how Ushahidi, a nonprofit platform, and social media helped to resolve different types of crises.
- *Quali-quantitative*: the subject is analyzed through two case studies, which cover different types of crises. Each case is supported by observatory evidence and by data that can better show the real impact of social media in crisis resolution. The case studies and the theoretical base are used to confirm or deny the two hypotheses.

The research paper starts from a broad analysis of the elements that are behind the structure of Ushahidi. After having defined what a social media is, we describe the structure of a social networking site (Facebook and Twitter) and the structure of a generic network. Then we

analyze two very important phenomena: the cross boundary collaboration and the word of mouth communication.

In the second chapter, we describe the Ushahidi platform. An analysis of two crises will be presented in order to understand how it works.

The outcomes then will be applied to verify the initial hypotheses and to outline the most relevant problem.

The general data used in the two cases are provided by Ushahidi. From these databases, we extrapolated the relevant data useful for our research objective.

## **Literature Review**

The research paper aims to explore the theory and the cases of the use of social media in nonprofit platforms that monitor what is happening in a specific area during a crisis or an emergency.

The main theoretical base on crisis management regarding social media and nonprofit platforms, in particularly regarding Ushahidi, has been provided by two authors: Connie M. White and Patrick Meier.

- *Connie M. White*: she is an assistant professor with the Institute for Emergency Preparedness at Jacksonville State University, Alabama. Dr. White is the director of Information Technology Solutions for Emergency Management (ITSFEM), an education and consultation company. Her oeuvre entitled “Social media, crisis communication and emergency management: Leveraging Web 2.0 technologies” treats step-by-step how collaborative applications, social media, nonprofit platforms can be leveraged together to solve crises and emergencies.
- *Patrick Meier*<sup>1</sup>: he is an internationally recognized thought leader on the application of new technologies for crisis early warning, humanitarian response, human rights, and civil resistance. He is the Director of Crisis Mapping at Ushahidi, co-founder of the International Network of Crisis Mappers and previously co-director of Harvard University’s Program on Crisis Mapping and Early Warning. Thanks to his research, we can have an understanding of the Ushahidi’s structure and an overview of different issues that are arising.

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<sup>1</sup> **Patrick Meier**: for further details regarding his research see the bibliography at the end of the research paper and his blog: <http://irevolution.net>

Two researchers helped us to find the data and talk with the Ushahidi's community: Heather Leson, who is in charge of community engagement and Heather Ford an ethnographer at Ushahidi and SwiftRiver.

The other theoretical part and some problems are based on other research papers of different authors that can be found in the bibliography at the end of the research paper.

For the Libya case and some issues due to their recentness, there is no literature or very little, but only press articles, blogs and NGO reports.



# CHAPTER 1

## 1.1 Social media

Social media are “a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0 and that allow the creation and exchange of user generated content (UGC)”<sup>2</sup> (Kaplan and Haenlein, 2010, pg61). This broader definition refers to different applications that Kaplan and Haenlein (2010) categorize according to the richness of the medium and the degree of social presence it allows<sup>3</sup>. Media richness refers to the amount of information transmitted in a certain time with the goal to avoid ambiguity and uncertainty. The degree of social presence determines how two people can communicate each other and the influence they have on changing other’s behavior.

For the purposes of our research, we focus only on two categories of social media classification.

The first category refers to content communities. They are used to share contents between users. This content can be videos (e.g. YouTube, Vimeo), photos (e.g. Flickr, Picasa, and Instagram), presentations (e.g. Slideshare) and text (e.g. Scribd). In these sites, the registration is not mandatory but some of them require it to upload new contents.

Recently, content communities are increasingly used to upload and share information regarding wars, revolutions, strikes and other news that was usually streamed by traditional media. Bowman and Willis (2003, pg9) define this phenomenon as participatory journalism; it is “the act of a citizen, or group of citizens, playing an active role in the process of collecting, reporting, analyzing and disseminating news and information.” According to Bowman and Willis (2003, pg9) the main objective of participatory journalism is to “provide independent, reliable, accurate, wide-ranging and relevant information that a democracy requires”. It is a bottom-up process, strictly correlated with the second category that we are going to analyze.

The second category refers to the social networking sites, applications for people’s connection and communication. The world of social networks is vast and diversified; each one has been created for a particular target and for different scopes. Nowadays, thanks to their deeply diffusion in the world, new uses have been discovered and created, some of them never thought by the social networks’ founders. The Participatory journalism is one of the new uses

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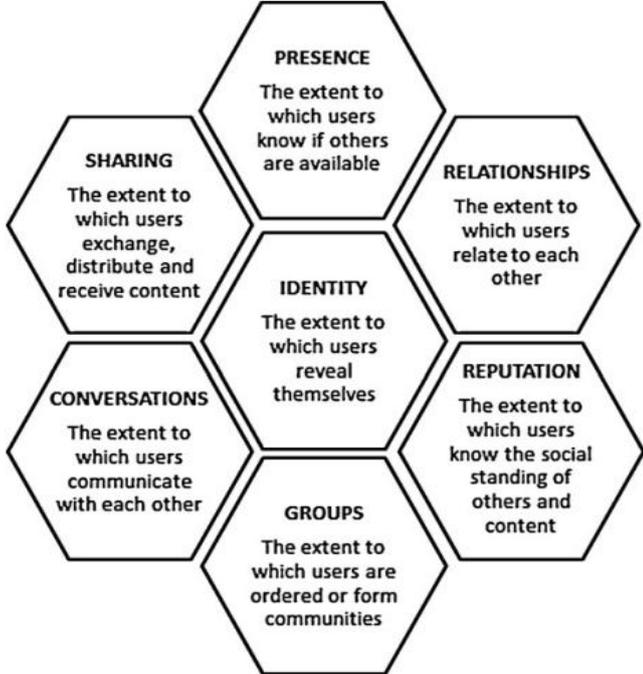
<sup>2</sup> **User generated content (UGC)**: describes the various forms of media content that are publicly available and created by end-users (Kaplan and Haenlein, 2010).

<sup>3</sup> **Classification of social media**: for more information regarding the classification, see Kaplan and Haenlein (2010) *Users of the world, unite! The challenges and opportunities of Social Media*. Business Horizons 53, 59-68

and another is the entrance of nonprofit organizations that changed the social networks' perception among users. We will analyze the two major social networks: Facebook and Twitter in the next subchapters. Now we want to describe the characteristics of a generic social network and the participants' needs in an online community.

Kietzmann et al. (2011) use a honeycomb framework (Figure 1.1.1) to show seven functional building blocks that are the facets of a social medium. We can adopt this model focusing only in the structure of a social network. This model and the model of Eggers et al. (2011) that we will describe in subchapter 1.3 permit an overview of the relations between Ushahidi platform (chapter 2) and social media.

**Figure 1.1.1:** The honeycomb of social media (Kietzmann et al., 2011)



The identity is the first functional block. The majority of social networks require an identity to be used to start; the participants can use their real names or nicknames. The identity includes different types of user information, the basic ones, such as name, gender, age and more complex ones which are very important for segmentation and consequently to create specific targets. When we talk about identity, we have to talk about privacy, an issue that if it is not managed well, can decree the death of a social network. Kietzmann and Angell (2010) explain that users are afraid about the use of their information for surveillance and data mining by social network sites and secondary firms. Another concern is the use of fake identities for

different reasons. They are not easy to discover and in certain contexts, as in crisis management, they are dangerous and may provoke a lot of damages, delaying the emergency's resolution.

The conversation functional block represents “the extent to which users communicate with other users in a social media setting” (Kietzmann et al., 2011, pg244). The conversations' topics are the most disparate and some of them start to spread among the social network's users for all sort of reasons. According to Kietzmann et al. (2011) it is important to monitor the conversation velocity, the rate, and direction of change in conversation and what are the main conversation's trends. There are tools embedded inside social networks and external tools, which permit that; we will describe them in the next subchapters when we will analyze Twitter and Facebook. The problem of fake identities that we saw in the identity functional block is correlated with a big problem in the conversation block: the manipulation of conversations. This is a plague because it is not easy to identify and consequently to defeat. It is one of the social network's actual limits and a big issue to be addressed in crisis management.

Sharing is the third functional block; it describes the exchange of contents between users. Sharing is the major function in the category of content communities (Kaplan et al., 2011) and only marginal or absent in the category of social networks. In fact, during a conversation, videos and photos are shared but often in the form of links that redirect users to content community web-sites.

Kietzmann et al. (2011, pg245) define the functional block presence as “the extent to which users can know if other users are accessible. It includes knowing where others are, in the virtual world or in the real world”. Every social network's user has a virtual status, usually represented by a color (green means available and red means busy), which permits other users to start a conversation in the virtual world, even more in real time thanks to online chats. The users can also share, inside the social networks, their presence in the real world with the social check-in. Richmond, Riva (2010) explains that users can check-in to specific physical locations using an Internet connection or GPS with a PC or a smartphone. Users can also include pictures and text in the social check-in. In the last two years, this feature has been taken into account by marketers and scholars because it can be a gold mine of information regarding consumer behavior. They named it local-based marketing<sup>4</sup> or check-in marketing; it

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<sup>4</sup> **Local based marketing:** for more information see Krum, Cindy (2011) *Mobile Marketing*. Hoepli and De Felice, Luca (2011) *Marketing conversazionale. Dialogare con I clienti attraverso I social media e il real-time web*. Il Sole 24 Ore

is a new branch of mobile marketing. The possibility to check-in gave a boost to crisis management and in particular to nonprofit platforms, such as Ushahidi, because with this tool you can build an accurate map of the crisis area.

The relationship functional block describes the different relations that may occur between users. By relation, Kietzmann et al. (2011, pg246) mean “two or more users have some form of association that leads them to converse, share objects of sociality or simply just list each other as a friend or fan.” Every social network has a different relationship’s grade; for this reason the authors point out that the relationships can be formal and structured or informal and without structure. In some social networks, the relationship between users does not exist because their focus is the free flow of information without bounds. For a deep analysis of the relationship’s characteristics and their role in the network, we refer to subchapter 1.3.

Reputation is the sixth functional block. Kietzmann et al. (2011, pg247) define it as “the extent to which users can identify the standing of others, including themselves, in a social media setting.” In a social network, reputation refers to people and to content. For instance, a nonprofit organization that wants to open a social network account and engage users in the conversation has to upload relevant contents and then monitor the reputation with appropriate metrics. As the authors suggest, we can use objective data (e.g. the number of times the organization are mentioned, number of friends or followers) or subjective data (e.g. the number of times the organization is mentioned positively or negatively, rating system).

Groups are the last honeycomb block and represent “how users form communities and sub-communities” (Kietzmann et al., 2011, pg247). Social networks, as we saw for the relationship functional block, manage the group’s structure in a different way. The group may be just a list that regroups users, based on their topics of interest. However, the group can assume a more complex structure with different levels of access that in the majority of cases are at least three. The group is secret if an invitation is necessary to get in and view the contents. It is closed if you have to wait for the moderator’s approval and the group is open when everyone can be part of it and the outsiders can view the topics and conversations.

These different levels of access are very suitable for organizations that operate in crisis management and in an emergency context. For instance, the organization core team uses a secret group to organize the rescue mission and to share sensible information. Then the organization uses a closed group to discuss with partners and other NGOs. The open group is used to spread important news and commit the citizens to help during the rescue process.

Thanks to Kietzmann et al. (2011) now we have a complete overview about the structure of a generic social network but we need also to understand what the needs and the motivations of

users in online communities are. In this way, we can understand why some social networks stay alive and others die even if they have a perfect structure.

Kim, Amy Jo (2000) uses Maslow’s hierarchy<sup>5</sup> to explain this important topic; she exported the five people’s needs from the offline domain to the online domain (Figure 1.1.2).

**Figure 1.1.2:** Hierarchy of Needs in Online Communities (Kim, Amy Jo, 2000)

	<b>Need</b>	<b>Offline (Maslow)</b>	<b>Online Communities</b>
 Advancement in Hierarchy	<b>Physiological</b>	Food, clothing, shelter, health	System access; the ability to own and maintain one’s identity while participating in a Web community
	<b>Security &amp; Safety</b>	Protection from crimes and war; the sense of living in a fair and just society.	Protection from hacking and personal attacks; the sense of having a “level playing field”; ability to maintain varying levels of privacy
	<b>Social</b>	The ability to give and receive love; the feeling of belonging to a group.	Belonging to the community as a whole, and to subgroups within the community.
	<b>Self-Esteem</b>	Self-respect; the ability to earn the respect of others and contribute to society.	The ability to contribute to the community, and be recognized for those contributions.
	<b>Self-Actualization</b>	The ability to develop skills and fulfill one’s potential.	The ability to take on a community role that develop skills and opens up new opportunities.

If we pay attention to the different needs through the advancement in the hierarchy, we see the connection strictly within the honeycomb of social media (Kietzmann et al., 2011). We argue that the social network’s structure and participants’ needs create a symbiotic relationship between them and every need embodies one or more functional blocks.

Physiological is the first need and it is fulfilled if there is system access. The user needs a unique identity when he participates in a social network. This need is referred to the Identity functional block. We understand that people, also online, want to be unique and distinguish themselves from other users. To achieve it, they need an identity that everybody can recognize immediately. It is the first step in the hierarchy and at this point, we already have to face an important issue, fake identities. In the online word, much more than in the offline

<sup>5</sup> **Maslow’s hierarchy of needs:** is a theory in psychology proposed in 1943. “People are motivated by the urge to satisfy needs ranging from basic survival to self-fulfillment. They don’t fill the higher-level needs until the lower-level ones are satisfied.” (Maslow, A.H., 1943)

world, stolen identity or fake identity creation have a power that can totally destroy the person's existence with possible repercussions in the real world.

Strictly related with the first need is the security and safety need. Users want protection from hacking and personal attacks. Inside the social network, they desire varying levels of privacy as we saw in the groups honeycomb block. Maslow, A.H. (1943) said people want to feel that they are living in a fair and just society. According to Kim, Amy Jo (2000), people want the same in the online world because it is increasingly a complementary world to the real one. Nowadays people do not accept being part of social networks where the privacy rules are not easily accessible and where they cannot modify their preferences regarding privacy.

Social is the third need. Every user wants to belong to a community as a whole and to groups within the community. In the offline world men are social animals;<sup>6</sup> this human characteristic remains also in the online world and it is one of the main reasons why users subscribe to a social network. The relationship and groups functional blocks are fundamental in a social network's structure because they are the answer to the social need.

When the user is finally part of the community, he wants to contribute and to be recognized for his contributions. This is the fourth need: self-esteem. Then the user tries to have a recognized role inside the community; he shares new ideas with the objective to develop the community because now he is at the top of the hierarchy of needs: self-actualization. These two needs are strictly related with three functional blocks of the honeycomb of social media (Kietzmann et al., 2011): conversations, sharing, and reputation.

Now we have an overview about the structure of a generic social network and its interactions with the people's needs in an online community.

Hence, in the next subchapter we are going to analyze the two major social networks: Facebook and Twitter.

## 1.2 Social Networking Sites

We decided to describe Facebook and Twitter not only because they are the most famous and diffuse social networks at this time but mostly because they are the first two to have developed a nonprofit area and they also are used by nonprofit platforms in crisis

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<sup>6</sup> **Social animal:** Aristotle introduced the notion of man as a social animal in his oeuvre Politics: "Hence it is evident that the state is a creation of nature and that man by nature is a political animal". The adjective political in Greek is "politikos" which came from the Greek word "polis" meaning city-state. To be "politikos" was to be a citizen and part of the society (community).

management. We argue it is necessary to have two practical examples to show how the theoretical base, that we discussed in the previous subchapter, has been implemented.

It is also important to stress that the social networks' world is continuously changing. MySpace was launched in 2003 and from 2005 until early 2008 was the most visited social network in the world. In April 2008, MySpace was overtaken by Facebook, which was founded in February 2004, in the number of unique worldwide visitors. In February 2012, it has more than 845 million active users. Another social network, Twitter, has more than 300 million users after 6 years from its foundation in 2006. It is growing very fast thanks to a unique characteristic, a microblogging service. In June 2011, Google also launched Google+, its own social network. In January 2012, it has surpassed a user base of 90 million and it could reach 400 million members by the end of 2012.

From this brief history of social networks,<sup>7</sup> we see that in less than 10 years, there was a huge turmoil of events and no one can predict what will happen in the next years.

For this reason, we must be very cautious and not blindly believe that Facebook and Twitter will still exist in 10 years.

Our analysis has the aim to learn their characteristics and their functionalities, which will be very useful even if in the future another social network will take the leading position.

### **1.2.1 Twitter**

Twitter is a social networking site with a microblogging service, a unique characteristic that distinguishes it from other social networks. Kaplan and Haenlein (2010), on the continuum of social media classification, place Twitter halfway between traditional blogs and social networking sites.

The name Twitter is not a random choice; it perfectly embodies its main feature as Jack Dorsey, the founder, said: "The definition was a short burst of inconsequential information and chirps from birds. And that's exactly what the product was."

A microblog indeed enables users to send and read messages (tweets) of 140 characters or less. It is also possible to send attachments like images, videos, soundtracks, links and the coordinates of the actual position. Every day over 1.6 billion search queries are handled and over 300 million tweets are generated within the Twitter environment. This incredible number gives Twitter the title of "the SMS of the Internet."

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<sup>7</sup> **History of social networks:** we found the data in articles of CNN and Los Angeles Times. For more details, see the bibliography.

To understand its success and how it works we are going to analyze some characteristics addressed by Kaplan and Haenlein (2011) and then its use in nonprofit sector and in crisis management.

The first concept stressed by Kaplan and Haenlein (2011, pg107) is called ambient awareness. They argue “several tweets together can generate a strong feeling of closeness and intimacy.” Twitter enables every user to tell the world what his feelings are, his mood and what he is doing at a particular time. In this way, users can “maintain a similar level of awareness of each other’s activities and status” even if they are not in the same physical location.

The notion of ambient awareness has also been taken into consideration by Jack Dorsey.

At the Digital Life Design conference, in Munich, he said that Twitter is no longer only a social network but it has evolved into an information tool that provides relevant information in real time. This is at the base of the idea to integrate in one platform the characteristics of a search engine (SEO) with the characteristics of a social network. It is a very promising business that involves Google, Facebook, and the Italian Volunia.

Bollen et al. (2011) used the Twitter’s ambient awareness to predict the stock market. They used one algorithm, called the Google Profile of Mood States (GPOMS), which measures mood in terms of 6 dimensions (calm, alert, sure, vital, kind and happy). Then they analyzed 9.7 million tweets and looked for correlations between the GPOMS and the Dow Jones Industrial Average. The authors discovered a correlation between the calm dimension and the index with an accuracy of 87.6%.

These examples show the importance of ambient awareness for the success of Twitter and how it can be used in different fields.

The second characteristic described by Kaplan and Haenlein (2011) is the push-push-pull communication. This type of communication is found only in microblogs and until now, it was not possible to use it in social networks like Facebook or Google+.

This communication is structured in a way that easily permits the spread of information and thanks to word of mouth,<sup>8</sup> a message can become viral and create a lot of buzz<sup>9</sup> in a short time. It is possible because Twitter devised two concepts called “follower” and “following.”

If a user decides to become a follower of another user, he will receive automatically all the future tweets written by that user; this is the first information push. Then the new follower can also re-tweet a message that he considers interesting and with his action start the second

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<sup>8</sup> **Word of mouth:** for more information see subchapter 1.4

<sup>9</sup> **Buzz:** is the interaction of consumers and users of a product or service that serves to amplify the original marketing message. It is an association, excitement or anticipation about a product or a service (Thomas Jr, Greg, 2006).

information push; the re-tweeted message now is visible to his network of followers. This mechanism permits fast diffusion of a tweet in the whole network in a few hours if it is sufficiently intriguing and fascinating for users. But the communication is even more pervasive thanks to the final step: the information pull. Once the tweet has been pushed several times through the network, it may be so important for some users to decide to increase the content's message, pulling additional information from other sources using the attachments. Thus, the push-push-pull communication of Twitter unleashes the entire user's communication power and it is extremely useful in crisis management.

The third characteristic outlined by Kaplan and Haenlein (2011) is the virtual exhibitionism and voyeurism that with the others two confirms the enormous potential of this mean.

Tweets, unlike other social networks, are public, everyone can read them and this creates "the perfect environment for virtual exhibitionism and voyeurism" (Kaplan and Haenlein, 2011, pg108). A lot of people create a twitter account only to follow the "twitter life" of other users passively. This phenomenon has grown exponentially when movie stars and VIPs started to post their daily routine. If we saw the number of active Twitter users and the number of tweets posted, we are in the presence of a Pareto distribution<sup>10</sup> where 10% of the active users account for over 90% of all tweets (Kaplan and Haenlein, 2011). This characteristic seems to be a negative aspect of Twitter because it allows an anonymous voyeurism, making it appear like an online Big Brother. In this way, Twitter seems to be used as a tool to satisfy trivial needs but we argue it is not the case. Every second 6146 tweets<sup>11</sup> become public knowledge; they can be shared, and utilized for different purposes like marketing studies, sociological studies and, most important for us, for crisis management.

For instance, during an emergency, every tweet about the crisis can be view instantly by everyone and this is a gold mine for the rescue teams and NGOs. This amount of data can be analyzed with the help of some tools like Ushahidi (chapter 2) to become more relevant and useful. Thus, the message's characteristic to be public is vital to sustain this emerging area.

Diaz-Ortiz, Claire (2011), the Head of Corporate Social Innovation and Philanthropy at Twitter and White, Connie M. (2011) examined the use of Twitter in detail in the nonprofit sector. The authors explain that one of the main reasons of Twitter's success has to be found

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<sup>10</sup> **Pareto distribution:** Pareto used this distribution to describe the allocation of wealth among individuals. He described that a larger portion of society's wealth is owned by a smaller percentage of the people in that society. This distribution is also called the Pareto principle or the 80-20 rule, which says that 20% of the population owns 80% of the wealth (Pareto, Vilfredo, 1964).

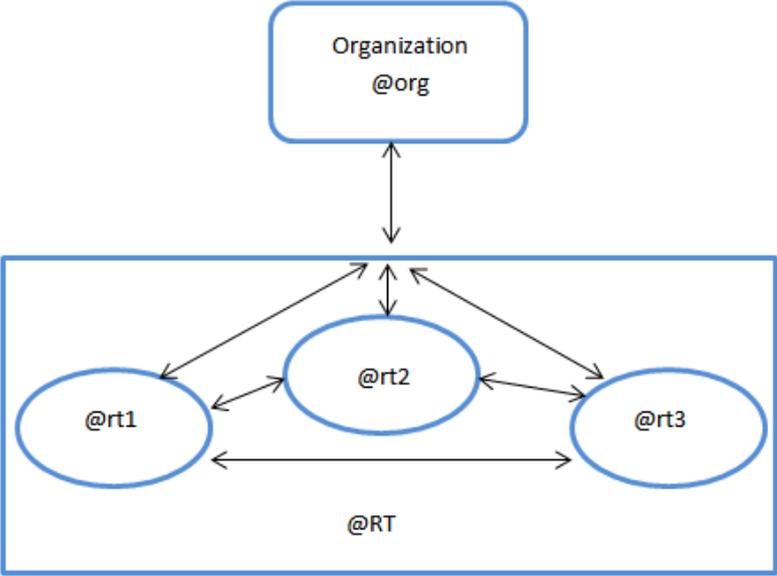
The rule is now applied in different fields; for example in economics, in sociology, in psychology.

<sup>11</sup> **6146 tweets:** average obtained by data in this web site: <http://yearinreview.twitter.com/en/tps.html>

inside its code. They are two built-in functionalities that have changed the way users communicate with each other: @at and #hashtag.

The @at is used to address the tweet directly to a specific user. In crisis management, every rescue team can constantly be in contact with others and with the organization and if necessary, send tweets to a specific user. For instance, there are three rescue teams coordinated by an organization, every user has a unique twitter account (e.g. @rt1, @rt2, @rt3, @org, @RT)<sup>12</sup> and, thanks to the built-in functionality @at, they are able to use the push-push-pull communication (Kaplan and Haenlein, 2011) in their information flow (Figure 1.2.1.1).

**Figure 1.2.1.1:** Information flow’s model with the use of @



The figure 1.2.1.1 illustrates the multiple ways information can be disseminated with the use of @at: one-to-one, one-to-many, many-to-one. Tweets are clearer than radio, communities and other organizations can follow the information flow and the ambiguity of communication is reduced (White, Connie M., 2011). Furthermore, the model, with the introduction of user @RT, is redundant and this fact increases the system’s reliability in the case of communication problems.

<sup>12</sup> @RT: it is a facultative user but if it exists, accelerates the information flow and helps the model’s redundancy.

The second built-in functionality is the #hashtag that permits adding further context to tweets (Diaz-Ortiz, Claire, 2011). Every word that follows a #hashtag automatically is identified and the tweet becomes part of a group of like-minded tweets. With Twitter's search engine, we can search a word of our particular interest and thanks to #hashtag functionality; we can see all the tweets that contain that word. It is possible, moreover, to create a list of content that it is updated continuously regarding a specific topic. All this utilization of #hashtag makes the work of nonprofit organizations faster because they can monitor all the tweets that mention words related to the current crisis. Thus, organizations, with the knowledge of the situation, manage the rescue teams better.

We analyzed the use of Twitter in crisis management but it is also employed in the nonprofit sector. For instance, Diaz-Ortiz, Claire (2011) comes up with the T.W.E.E.T. framework,<sup>13</sup> a model that permits an efficient use of this mean to nonprofit organizations. The letters T.W.E.E.T. stand for Target, Write, Engage, Explore, and Track. These are five steps that every nonprofit organization should follow to master the platform and are very similar to those for Facebook and other social network that we are going to describe.

## **1.2.2 Facebook**

Facebook is a social networking site (classification by Kaplan and Haenlein, 2010) launched in February 2004. It is the social network with the highest number of unique worldwide visitors. At the beginning of February, Facebook filed for an initial public offering (IPO) that could value the social network between \$75 billion and \$100 billion and the company hopes to raise as much as \$10 billion when it begins selling shares. In USA, about 50% of the population has an account and now Facebook is trying to enter Asia, especially in China, where there is a huge pool of potential users.

Facebook allows users to create a personal profile, called a "Diary" (before it was called the "wall"), where all of the personal information, status update, photos, videos and friends are shown in a timeline from the most recent to the oldest one, which should represent the day of your birth. Users can create and join interest groups and "like pages" which allow fans of a person, organization or product to communicate with each other. There are different levels of privacy but normally to see the entire profile of a user you have to be his friend. Thus he has to accept your friend request. It is a totally different approach compared to Twitter. Moreover,

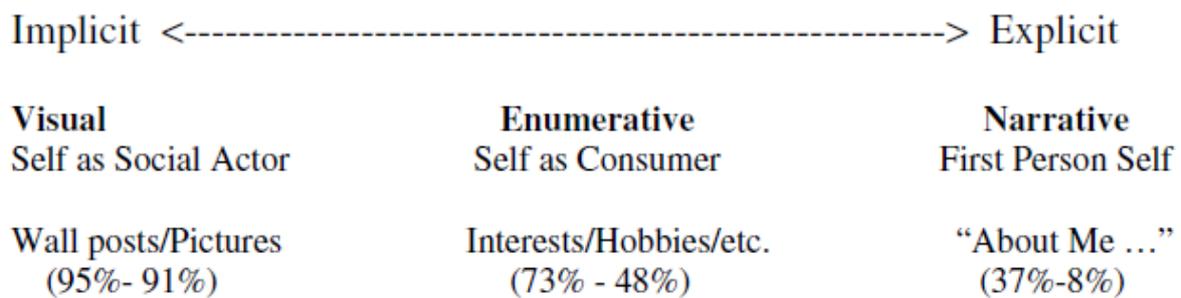
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<sup>13</sup> **T.W.E.E.T. framework:** for more information see Diaz-Ortiz, Claire (2011) *Twitter for Good: Change the world one tweet at a time*. Wiley John and Sons

users can communicate with friends through public or private messages, chat and, from July 2011, through video calling services using Skype, the new partner of Facebook.

Zaho et al. (2008, pg1820) argue that Facebook differs from other social networks as Twitter or MySpace, because it is “anonymous and institutionally bound.” These two characteristics reduce some privacy issues but the presence of fake identities and stolen identities still persist. The anonymousness of Facebook changes the user’s strategy in identity construction. Zaho et al. (2008, pg1824) based “on the extent to which visual and verbal techniques are involved”, distinguished a continuum of modes of self-presentation on Facebook from implicit to explicit identity claims (Figure 1.2.2.1).

**Figure 1.2.2.1:** The continuum of implicit and explicit identity (Zaho et al, 2008)



The implicit identity claims (95%-91% of users) are visual, involving the display of photos (Zaho et al., 2008). The pictures are uploaded by the users themselves or by their friends with the extensive use of tags<sup>14</sup>. The photos are objects through which users show the “self as social actor.” The final goal is to generate in the viewers, the idea that they have a deep and extensive network of peers and friends. For instance, in their experiment Zaho et al. (2008) found a wide range of photos depicting users “in the context of their friends, mostly smiling, having fun or expressing affection for one another.”

The second identity claims (73%-48% of users) are enumerative, and they express the “cultural self” or the “self as consumer.” Users enumerate and describe their consumption and cultural preferences and their tastes. The large majority of users prefer to write about their interests (73%) and quotes (71.4%), followed by consumption activities like movies (65.1%), music (65.1%) and books (57.1%). This is the in-between category and it is the consumer identity defined “as much by what the market offers as by individual or character traits” (Zaho et al., 2008).

<sup>14</sup> **Tags:** are non-hierarchical keywords or term assigned to a piece of information (image, file, and bookmark). It helps describe an item and allows it to be found again by browsing or searching (Wikipedia, 17/02/2012).

The third identity claims (37%-8% of users) are narrative and they express the first personal self, the “about me” statement. Very few users narrate something about themselves and when they do it, they prefer to write just short sentences. Facebook users do not like to show themselves, using explicit ways; they define themselves through their belonging network: “see me first and foremost in the context of my group” (Zaho et al., 2008, pg1826).

The continuum of implicit and explicit identities clearly describes the importance and relevance of the network for Facebook users. This is extremely important from the point of view of nonprofit organizations and in crisis management.

Aaker and Smith (2010), after having analyzed the characteristics of Facebook and other social networks, built a model to drive social change called “The Dragonfly Effect<sup>15</sup>.” They used the word dragonfly for the name, an insect able to propel itself in any direction when its four wings work together, because they wanted to stress the importance of integrated effort and that small actions can create big movements. In the framework, every wing represents an action (Focus, Grab Attention, Engage and Take Action) that a nonprofit organization should follow to reach its objectives. “The Dragonfly Effect” is very similar to “The T.W.E.E.T. framework” (Diaz-Ortiz, Claire, 2011) that we analyzed before; this is explained by the fact that the structure of social networks has common characteristics. Thus, for nonprofit organizations it is easier to reach the audience and engage users if they have a global strategy regarding social networks.

Facebook also is used in crisis management as a facilitator in the communication between organizations, members, and users. Its functioning is explained fully by “Groups” one of the honeycomb blocks that we analyzed in the subchapter 1.1 (Kietzmann et al., 2011).

### **1.3 Cross boundary collaboration**

Eggers et al. (2011) in a GovLab study in collaboration with The Harvard Kennedy Ash Center, define the cross boundary collaboration (XBC) as an approach to create value from networks that always involve people’s collaboration from outside the organization.

The Crowdsourcing is another term coined in 2006 by Howe (2006) to define the same concept: a large group of people or a community handling tasks that have traditionally been associated with a specialist or small group of experts.

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<sup>15</sup> **The Dragonfly Effect:** for more information see Aaker and Smith (2010) *The Dragonfly Effect: quick, effective, and powerful ways to use social media to drive social change.* Jossey-Bass

These networks are composed by private citizens, companies, nonprofit organizations and sometimes by government agencies.

At the beginning of the twentieth century, the XBC started to be utilized but none in an extensive manner because the transaction costs were too high. Today, the Internet and new technologies such as social media and smartphones enable drastic reductions in transaction costs. Millions of potential collaborators can be contacted easily and engaged in a few minutes. Then it is easy to build a powerful network and create an ecosystem in which people can share their knowledge and give a fundamental contribution to achieve the objective.

To show the potential of XBC, Eggers et al. (2011) described an experiment done by the Defense Advanced Research Projects Agency (DARPA). In 2009, DARPA organized a competition, the goal was to find ten red balloons placed around the continental United States and the prize for the winner was a \$40,000. With this experiment, DARPA wanted to know how participants use the Internet and social media to form a network and find the balloons, because it was an impossible task for one person. The winning team from MIT, in 8 hours and 52 minutes, discovered the right location of all 10 balloons. How was it possible?

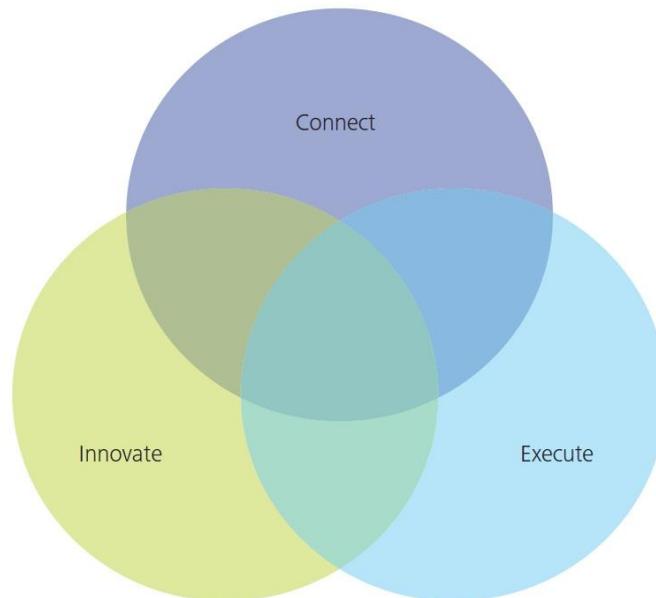
Riley Crane, the leader of the team explained that essential for the win, was the use of the XBC. His team built a social platform based on a networked incentive scheme, everyone who found a balloon and everyone who invited the finder received a prize's percentage. Over 4.000 people participated to solve the problem.

This experiment demonstrates the power of social network and social media and the notion that "regardless of how much information resides within an organization, there is nearly always more on the outside." (Egger et al., 2011, pg4).

Egger et al. (2011) describe the XBC as a cluster made by three modalities: to connect, to innovate and to execute (Figure 1.3.1). As we saw before, the XBC connects individuals and organizations and thanks to them, it can grow and strengthen the bonds between the nodes. The XBC creates innovation because different people with different backgrounds can see new problems to be solved or discover new solutions. Moreover, with the use of XBC the tasks can be executed more efficiently and faster, thanks to the wide range of collaborators.

These three modalities permit discovery of four big benefits that the XBC brings to the organizations. They are: do more with less, turbocharge innovation, deliver a mission more effectively, and tackle wicked problems.

**Figure 1.3.1:** The three modalities of XBC (Egger et al., 2011)



The first benefit “do more with less” and the third one “deliver a mission more effectively” that Egger et al. (2011) describe in the study very linked very strongly with each other. The social network, with its nodes and vast connections between them, allows creating value at a lower cost and improves the performances. Thanks to the new technologies, the transaction costs have almost disappeared. The second benefit “turbocharge innovation” demonstrates how the XBC can use the leverage effect in the domain of innovation. If we want to improve our expertise and know the experts in different fields, it is necessary to create a network that connects the organizations with the outside. In this way, the organization inside the social network becomes a collective intelligence<sup>16</sup> (Hofstadter, 1979). The fourth benefit “tackle wicked problems” can also be explained with the notion of collective intelligence. An organization can overtake a huge problem thanks to the XBC. The problem is divided into sub-problems that are more easily manageable and every part of the network solves the specific sub problem that has been assigned to them. Moreover, the solution generally is discovered faster as we saw in the DARPA experiment. This proves that the XBC manages the complexity very well.

Egger et al. (2011), after having analyzed different networks, using the three modalities of the XBC and the four benefits, came up with six vectors that are the main characteristics of a

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<sup>16</sup> **Collective intelligence:** is a shared or group intelligence that emerges from the collaboration of many individuals and appears in consensus decision making. Wheeler (1960) saw this process at work in ants and called it a “super organism.”

generic network (Table 1.3.2). Then for every characteristic, they gave a score on a one to five scale. At the end, using this scale, they categorized ten different types of network<sup>17</sup>.

**Table 1.3.2:** The six vectors of a generic network (adaptation from Egger et al., 2011)

<b>Vector</b>	<b>Description</b>
<b>Transparency</b>	The grade of information’s visibility inside and outside the network.
<b>Cost effectiveness</b>	How many resources are available and how they are used.
<b>Accountability</b>	How much the information is reliable.
<b>Security</b>	The level of information protection and the protection level to have access inside the network.
<b>Innovation</b>	How much innovation the network is providing
<b>Mission criticality</b>	How the network is vital to the organization’s mission.

For our purposes, we analyze only the grassroots network in-depth because it is the structure on which it has based Ushahidi, a nonprofit platform that we will describe in chapter 2.

In this network, there is not an ongoing central facilitator but many participants that collaborate to achieve a common objective. The grassroots network has a decentralized leader; for this reason it is very important to have many participants because as the number of them increases, the network’s power increases.

As we see in Figure 1.3.2 there are not barriers to entry; therefore the transparency vector scored five out of five. Also, the cost effectiveness vector and the innovation vector scored five out of five; these are positive aspects because they mean that the network creates a huge amount of innovation and at the same time, the resources are used to their full potential.

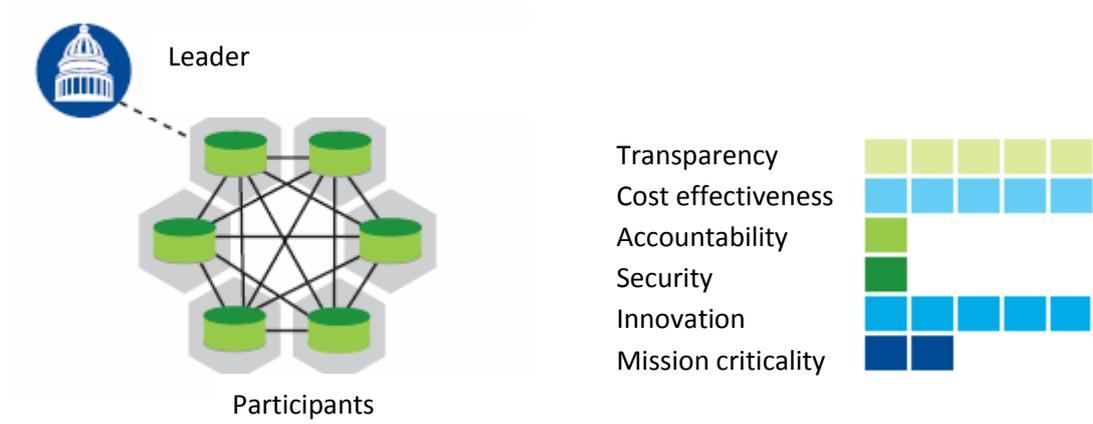
However, the accountability vector and the security vector scored only one out of five. These are two negative aspects that we will deepen in chapter 3.

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<sup>17</sup> For more information regarding the ten types of network, see Egger et al. (2011) *XBC. Creating public value by unleashing the power of cross boundary collaboration*. GovLab study in collaboration with The Harvard Kennedy Ash Center 23-24

According to Egger et al. (2011), the keys to success for the grassroots model are three. It is necessary to have an inspiring goal to ensure the participation and the motivation of the people; the participants have to be treated as equals and the network's size should be big.

**Figure 1.3.3:** The grassroots network (Egger et al., 2011)



However, these keys to success can become the network's limitations and if we consider also the two negative aspects (accountability and security), we come to the conclusion that the grassroots network is an unstable model. It has a great potential but can also easily fail. It is up to the organization to monitor the network and see if it is a good tool to use for its mission. We think that a solution to increase the possibility to have a stable model is the playsourcing (Horvath and Conner, 2010) explained at the International Conference on Crisis Mapping. Horvath and Conner (2010) describe the playsourcing as a way to motivate a crowd by embedding human intelligence tasks (HITs)<sup>18</sup> in a social game.

Foldit is an example described by White, Connie M. (2011), of the use of HITs in a social game. While participants play 3D puzzle games, they are helping predict protein structure and design new proteins. These tasks are very hard to solve automatically but very easy for human beings.

It is also necessary to include some features in a playsource system with the aim to maintain the user's attention and to prolong his work's time. White, Connie M. (2011) shows eight features which we can see in the table 1.3.4.

<sup>18</sup> **Human intelligence tasks (HITs):** the use of human intelligence to perform tasks that computers are unable to do yet (e.g. image or text interpretation). This concept was invented by Amazon in 2005. The service Amazon Mechanical Turk (MTurk); it is a crowdsourcing Internet marketplace that enables computer programmers to coordinate the use of HITs.

**Table 1.3.4:** The eight features to include in a playsource system (adaptation from White, 2011)

<b>Feature</b>	<b>Description</b>
<b>Rewards</b>	All of the things that convey status. For instance, badges and experience points that might be exported in the social networks.
<b>Kudos</b>	They are nonacquisitive rewards that contribute to boosting the status.
<b>Collaboration</b>	It is important to build a sense of community and provide all of the participants a way to share the information with each other.
<b>Competition</b>	Show ranking of players can increase the return rate.
<b>Entertainment</b>	Interrupt the tasks' flow with a break of pure entertainment.
<b>Imaginative display</b>	The graphic is very important to help the user in its task.
<b>Framing story</b>	If the task is embedded in a framework, it is easier for the player to understand the mission.
<b>Related news and information</b>	News feed regarding the topic of the task.

Thanks to these features, we can build an efficient playsource system and embed it in the grassroots network. After that, the system runs in the way explained by White, Connie M. (2011).

The system receives the crowdsourced data, assigns the different tasks to the users then it stores the results in a database, and delivers them to the organization. At the end of the process to ensure a high quality of the data, the playsource system does an automated crosscheck. It exploits one of the major network's characteristics: the redundancy. The system sends the same task to different users and compares the results. Then the organization can check the percentage of reliability for each task.

The grassroots network with the playsource's implementation not only increases the probability to reach the three keys to success but also increases the accountability vector because the information is more reliable.

As we saw, the XBC is a very powerful tool and in the next years, it will continue to grow and improve. The XBC "is changing the way government, corporations, and others tackle complex issues and problems; it is leading to an entirely different mindset about how product development, problem solving and decision making take place" (Lee, former director of the Transformational Convergence Technology Office at the DARPA).

## **1.4 Word of mouth**

In the previous subchapter, we saw the importance of creating a network, where the participants are engaged in the organization's mission easily and they can exchange information and create new contents. One of the most important elements to do that is word of mouth (WOM) communication. The WOM is "oral, person to person communication between a receiver and a communicator" (Kirby et al., 2006, pg6) and it is the cornerstone for the network's creation.

One of the pioneers in this area is Silverman (2001) who created a WOM model called teleconferenced peer influence groups. In the '70s, he conducted a series of focus groups with the objective of seeing if the WOM was a boost to the creation of a solid network. He engaged a group of physicians to talk about new pharmaceutical products. Silverman (2001) noticed that one or two physicians who had a positive experience with a new product could influence a large group of physicians that in turn could spread information to others groups.

We understand that if there is a right catalyst, thanks to the WOM, the network can be built easily.

Nowadays, the WOM is used extensively through the Internet and this makes sure that communication is faster and more versatile; instantly, the information can be spread around the world. This type of WOM is called online word of mouth (OWOM) or electronic word of mouth (eWOM) and it is the online communication between a receiver and a communicator (Rosen, 2000). The organization, in order to extract the maximum potential from the network, must understand the causes of WOM and the effects of WOM.

Kirby et al. (2006) describe the causes and effects in a matrix (Figure 1.4.1) in which they are analyzed from the communicator's viewpoint and from the receiver's viewpoint. This allows us to have a global vision of the WOM.

**Figure 1.4.1:** The WOM matrix (Kirby et al. 2006)

<b>Unit of analysis</b>	<b>Main focus of study</b>	
	Antecedents to WOM (causes)	Consequences of WOM (effects)
Receiver of communication (input WOM)	<b>QI:</b> Why do people listen? <b>Related variables:</b> external information search, perceived risk, type of relationship with source (tie strength)	<b>QII:</b> The power of WOM <b>Related variables:</b> key communication effectiveness variables (awareness, attitude change, behavioral intention)
Communicator (output WOM)	<b>QIII:</b> What makes people talk? <b>Related variables:</b> opinion leadership, satisfaction or dissatisfaction	<b>QIV:</b> What happens to the communicator after the WOM event? <b>Related variables:</b> cognitive dissonance, ego-enhancement

Quadrant I (QI) and quadrant II (QII) explain the causes and the effects of WOM from the receiver point of view. In QI, the authors explain the importance of seeking information coming from different sources and the type of relationship with sources are at stake in the creation of effective WOM. These variables will be stressed in Ushahidi’s analysis. In QII, we see the consequences of WOM, how the receiver changes his perception regarding the particularly situation in progress. The WOM improves the receiver’s awareness and his behavioral intention. A better and clearer understanding of what it is going on allows the receiver to begin a new communication source and then a new communicator. This process is behind the network’s growth.

Quadrant III (QIII) and quadrant IV (QIV) explain the causes and the effects of WOM from the communicator’s point of view. In QIII, Kirby et al. (2006) show the central role of opinion leadership. According to Rogers (1995), opinion leaders are individuals who render advice, information and influence the attitudes or behaviors of others. They can disseminate information outside their belonging group because they are associated with multiple social networks. Thus, opinion leaders modify a receivers’ attitude, one of the variables of QII. The

effects of output WOM (QIV), after the information's dissemination, are related strictly with the effects of input WOM (QII). Opinion leaders and communicators in general, can have a cognitive dissonance<sup>19</sup> or ego-enhancement.<sup>20</sup> If they successfully influenced the receivers' behavior and participated in the network's growth, communicators have an ego-enhancement because they fulfilled their main objectives; otherwise, they have a cognitive dissonance.

Kirby et al. (2006) with the WOM matrix explain to us every WOM's facet. After that, the organization has to focus on how the social interactions among participants build and shape the network. Social interactions, as we saw before, are one of the variables (QI) in the WOM matrix.

Goldenberg et al. (2002, pg6) consider these interactions part of a complex system problem which is "a system consisting of a large number of members who maintains linear interactions with one another to form nonlinear macro behavior" (Casti, 1996). Goldenberg et al. (2001) use the cellular automata model<sup>21</sup> to formalize the complex system problem. The model analyzes the local interactions among users and tracks their changing states over time.

Usually the model is applied by marketers to see the diffusion process of a product thanks to WOM, especially in the high tech market. For our purposes, the cellular automata model is a tool that can show us the social interactions inside and outside the network and the presence of strong and weak ties. This model is central to understanding the structure of Ushahidi, the platform that we analyze in chapter 2.

Goldenberg et al. (2001) assume a simulated social system (Figure 1.4.2) where there are a finite number of individuals and each individual receives information during a determined number of periods. In the social system, there are two types of social interactions. The first type is the communication stream among individuals of the same network (strong ties). The second one is the communication stream between individuals of different networks (weak ties).

Furthermore, Goldenberg et al. (2001) describe two states of members. The member can be "informed" if he receives the information and knows about the objective, otherwise the member is "uninformed" if he has not received the information.

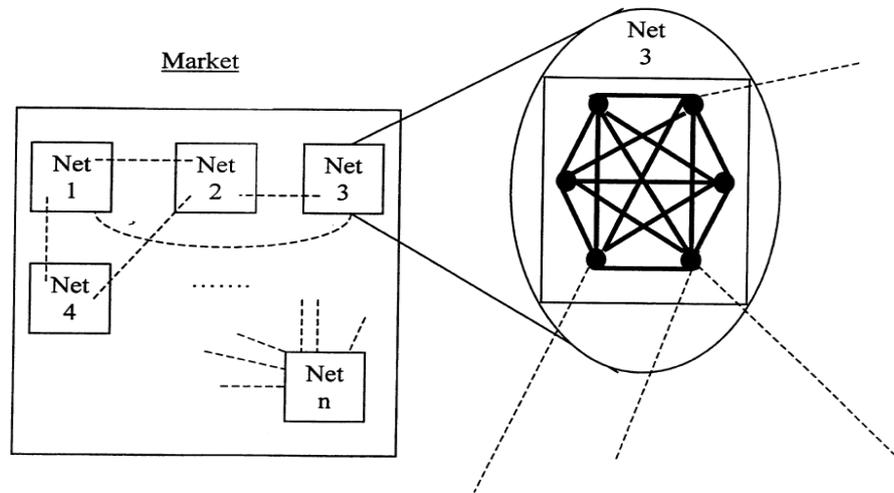
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<sup>19</sup> **Cognitive dissonance:** is a discomfort caused by holding conflicting cognitions (e.g. ideas, beliefs) simultaneously (Festinger, Leon, 1957).

<sup>20</sup> **Ego-enhancement:** psychological mechanism that drives differences in judgments about effects on self and others (Boyle, Michael P, 2008) (e.g. if a person influences another person, he feels better and his ego becomes bigger.)

<sup>21</sup> **Cellular automata model:** for a detailed mathematical description see Adami, Christoph (1998) *Introduction to artificial life*, New York: Springer. Toffoli and Margolus (1987) *Cellular automata machines*, Cambridge, MA: MIT Press.

**Figure 1.4.2:** Network (Goldenberg et al., 2001)



Goldenberg et al. (2001, pg215) also define the interpersonal contacts ( $\beta$ ) as “the probability of a uniformed individual to be affected by an informed individual in one period (change the individual’s state from uninformed to informed).”  $\beta$  has two subscripts  $w$  and  $s$ , they describe if the source of the information comes from a different network ( $\beta_w$ : weak ties<sup>22</sup>) or from the same network ( $\beta_s$ : strong ties<sup>23</sup>).  $\beta_s$  is larger than  $\beta_w$  because there is a greater probability that the individual changes his state due to the influence of a user from the same network than from a user of a different network.

Each individual cannot be in different networks and in a generic period  $t$  he is connected to  $j$  informed individuals coming from different networks and  $m$  informed individuals belonging to his network; these are other assumptions made by Goldenberg et al. (2001). An additional parameter is  $\alpha$  explained by the authors as “the uniformed individuals’ probability of becoming informed through their exposure to media sources.” The probability  $\alpha$  is smaller than the probability  $\beta$ .

The probability  $p(t)$  of the individual becoming informed in period  $t$  is given by:

$$p(t) = (1 - (1 - \alpha)(1 - \beta_w)^j(1 - \beta_s)^m)$$

<sup>22</sup> **Weak ties:** in figure 1.x they are depicted with dotted line.

<sup>23</sup> **Strong ties:** in figure 1.x they are depicted with solid line.

With the equation, Goldenberg et al. (2001) are able to show systematically how the cellular automata work (Figure 1.4.3). This equation can be used by organizations to monitor the status of their networks and at which level the social interactions are developed.

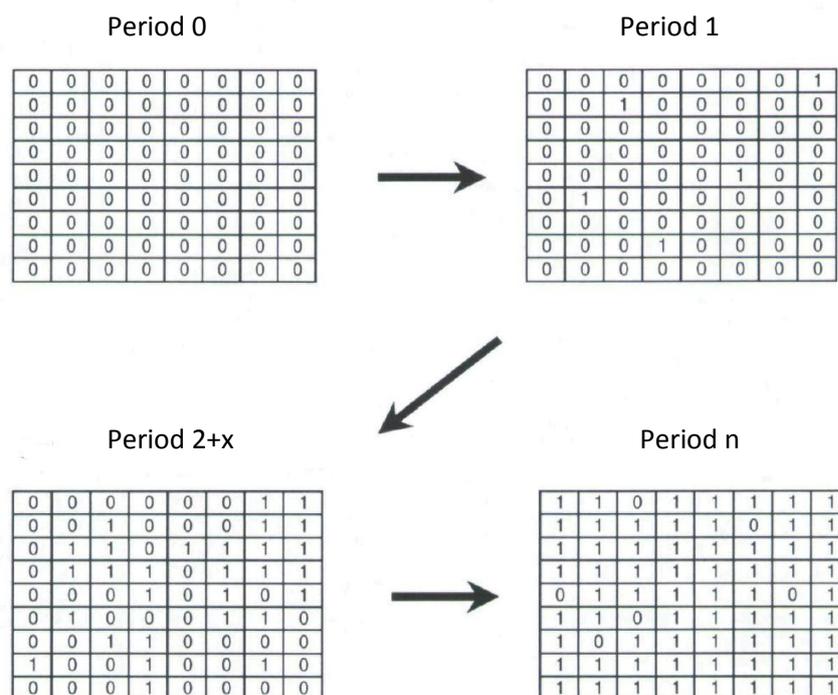
In *period 0*, all individuals are uninformed; thus, all of the parameters are 0 and  $p(t) = 0$ .

In *period 1*, only general media sources ( $\alpha$ ) are at work because WOM needs at least one informed individual to start the spread of information. To see if an individual changes his state, Goldenberg et al. (2001) extrapolate a random number  $U$  from an uniform distribution  $[0,1]$ . The generic individual becomes informed only if  $U < p(t)$ .

In *period 2*, the WOM starts to work and thanks to it the users begin to build strong and weak ties. As we saw in *period 1*, the generic individual changes his state only if  $U < p(t)$ .

After *period 2*, the process is iterated until *period n* when 95% of the system is informed.

**Figure 1.4.3:** The cellular automata process<sup>24</sup> (Goldenberg et al., 2002)



After the cellular automata has finished running, Goldenberg et al. (2001) found interesting results that are very useful to support our hypothesis regarding the power of WOM in the network's creation. Goldenberg et al. (2001) show that the influence of weak ties on spreading information is at least as strong as the influence of strong ties. The weak ties are central in the continuation of the process because the strong ties, as the time passes,

<sup>24</sup> **The cellular automata process:** value 0 represents an uninformed individual, value 1 represents an informed individual

exponentially lose their effect. When inside the same network, the majority of individuals are informed, the influence of weak ties starts to grow. They are the catalyst to activate new networks that, after some period, merge and form a new, bigger network.

The second result provided by the cellular automata model is the diminishing of the power of media sources just after a few periods. The WOM (strong and weak ties) has the major role in spreading information and in the creation of social relations. Goldenberg et al. (2001) explain that the impact of media source diminishes to one third and one quarter of the impact of strong and weak ties when 50% of all individuals in the social system are informed.

We consider the WOM matrix and the cellular automata model useful to better understand theoretically the organization's structure and in particular the Ushahidi's structure that we are going to analyze in chapter 2.

## **1.5 Hypotheses**

Since there are not previous studies that have tried to analyze the relation between social media and nonprofit platform; our literature review within chapter 1 has described, from a theoretical point of view, the different elements that make up the Ushahidi platform.

Through this element we can state both of our hypotheses.

The subchapter 1.2.1 about Twitter is the first element that allows us to articulate the first hypothesis (H1) "social media in nonprofit platforms increase the speed in the resolution of a crisis in comparison to traditional means."

The ambient awareness and the push-push-communication (Kaplan and Haenlein, 2011) are two characteristics of the social network allowing an incredible speed increase regarding the information dissemination. Moreover, they are assisted by two internal functions: @at and #hashtag (White, Connie M., 2011), which further boost the spread of information.

The second element is the WOM communication (subchapter 1.4). Through the cellular automata model of Goldenberg et al. (2001), we understood how the information is spread through a network and we can measure the time required for the majority to be informed.

The XBC (subchapter 1.3) and the structure of social network (subchapter 1.1 and 1.2) are the two elements that we use to state the second hypothesis (H2) "social media in nonprofit platforms increase the efficiency in the resolution of a crisis in comparison to traditional means."

In fact, the social networks can facilitate the construction of an efficient network as we saw within the honeycomb of social media (Kietzmann et al., 2011) and more specifically when

we described Facebook, which allows the management of groups with different levels of security and privacy.

Then, with the use of XBC, the tasks can be executed more efficiently and faster, thanks to the wide range of collaborators (Egger et al., 2011).

All of these elements support our hypotheses but it is necessary to verify them empirically; for this reason, in chapter 2 we are going to analyze two case studies: The Haiti earthquake and the Libyan civil war.



## CHAPTER 2

### 2.1 The role of ICT in crisis management

In recent years, we started to see and to understand the huge potential of Information Communication Technologies (ICT)<sup>25</sup> as a means to improve crisis response and crisis information management. Ahtisaari, Martti (2011), Nobel Peace Laureate, listed a series of general benefits of ICT in crisis management

- Reduce loss of life
- Provide access to critical, real-time information, crucial in timely and appropriate decision-making in crisis situations
- Enable the Government of recipient countries to make well-informed decisions regarding allocation of resources and a means through which victims can give feedback regarding aid promised and received
- Create institutional memory of crisis management operations which often are characterized by a rapid turnover of staff
- Improve the safety and security of all personnel in crisis areas
- Improve situational awareness and create opportunities for early warning on threats.

Today, ICT is a source of empowerment and certainty during the crises but to reach this level it has been necessary to rethink the core of ICT through several improvements and modifications.

Meier, Patrick (2011, pg12) argues that now we are using the fourth generation (4G) of early warning systems, which makes use of “free, open-source software and mobile technology.” It is a bottom-up approach relying on information gathered from locals and communities and focusing on people in crisis areas. These people are no longer just victims but they can be individuals able to become an active part, during an emergency. For instance, Ushahidi and Sahana<sup>26</sup> are two systems that belong to the fourth generation.

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<sup>25</sup> **Information Communication Technologies (ICT)**: refers to technologies that provide access to information through telecommunications. It focuses primarily on communication technologies and other communication mediums (Internet, smartphones, and networks).

<sup>26</sup> **Sahana**: was conceived during the 2004 Sri Lanka tsunami. The Sahana Software Foundation “is dedicated to the mission of saving lives by providing information management solutions that enable organizations and communities to better prepare for and respond to disasters. It develops free and open source software and provides services that help solve concrete problems and bring efficiencies to disaster response coordination”.

First (1G) and second (2G) generation represent “state-centric, institutional, and rigid top-down approach to conflict early warning and rapid response” (Meier, Patrick, 2011, pg12). They are hard to manage because they require integrated, multilevel action and they focus on the macro-level scale. In this way, these systems, trying to predict the development of economic, political, and social situation, lose information coming from the micro-level represented by witnesses and local communities.

Third generation (3G) systems are “located in conflict countries and are often run by national NGOs, sometimes collaborating with an INGO,<sup>27</sup> often using proprietary software” (Meier, Patrick, 2011, pg12) and to some extent they are similar to the new ones.

After having described the four generations and their differences, it is important to understand which elements are fundamental to have a real 4G early warning system.

According to Meier, Patrick (2011), there are five elements that characterize every early warning system. The major difference from a 4G system and an older one is in the utilization of these elements and their compliance to the 4G system’s characteristics.

The first element is the information service. The 4G systems are more service-based compared to the 1G and 2G systems that aim only to extract data from the crisis areas to create empirical models for institutions or academic users. The purpose of 4G systems is “to provide demand-driven information services for vulnerable communities so they can make more informed decisions on how to increase their resilience” (Meier, Patrick, 2011, pg13).

The second element is the empowerment. The 4G systems promote, as we saw, a bottom-up approach and a people-centered system. The objective is to empower local communities at risk in the medium-long term, in order to reduce their vulnerabilities. The idea behind this strategy is to understand that local people are more consciousness regarding the signs that may herald a crisis and they had better known the territory and the social and cultural situation.

The United Nations also support the people-centered system because allows “individuals and communities threatened by hazards to act in sufficient time and in an appropriate manner so as to reduce the possibility of personal injury, loss of life, damage to property and the environment, and loss of livelihoods” (UN, 2006, pg2). Thus, it is a totally shift from the vertical top-down approach with a remote monitoring.

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<sup>27</sup> **INGO**: an international non-governmental organization has the same mission as a non-governmental organization but it is international in scope and has outposts around the world to deal with specific issues in many countries.

Technology is the third element in an early warning system. The type of technology implemented within the system determines the system's generation. Today "inter-governmental and non-governmental systems have not gone beyond the use of email and websites for dissemination. Access to technology remains very unequal among systems and the field of conflict early warning lags far behind in the use of innovative technologies and Web 2.0 applications" (OECD, 2009, pg13). The 4G uses open source technologies, that allow disseminating information through mobile communication systems and permitting also to crowdsource crisis information. The local communities can exploit these means to have a better knowledge of the situation, keeping in touch with NGO's and rescue teams.

Indicators are the fourth element. The 1G and 2G are used to monitor a crisis through indicators of war and violence but "early warning systems that focus exclusively on the dynamics of war will only provide half the picture" (Meier, Patrick, 2011, pg14). Nowadays 4G has started to monitor also the indicators of peace and cooperation thanks to the bottom-up approach and information coming from local communities. For instance, NGOs can identify "multiple entry points for intervention and a host of options for conflict prevention" (Meier, Patrick, 2011, pg14) and know if in the area there are already local organizations with expertise that are trying to solve the crisis.

The fifth element of an early warning system is preparedness. The 1G and 2G, adopting an external, hierarchical top-down approach, use model focused on prediction. These models can be very useful because they try to predict in which area there will be a natural hazard, a possible conflict, or an outbreak of violence. However, it is also necessary to provide local training and preparedness measures otherwise millions would die if they had not been trained and able to follow a predetermined pattern. For this reason, 4G emphasizes preparedness because it is fundamental within an efficient people-centered system. Only now disaster management community is starting to understand the importance to have an emergency plan which allows local communities to react in a proper way, but this issue is not recent in 1992, Rupesinghe and Kuroda said "early warning should not be an end in itself; it is only a tool for preparedness, prevention and mitigation with regard to disasters, emergencies and conflict situations, whether short or long term ones. The real issue is not detecting the developing situation, but reacting to it."

The 4G early warning systems, which embrace the five elements described by Meier, Patrick (2011), are called Humanitarian Free and Open Source Systems (hFOSS). These systems are

licensed under GNU.<sup>28</sup> Thus every organization can modify the system's structure to fit perfectly with its needs. hFOSSs usually are maintained by a community or a team of volunteers or a nonprofit organization. In the last years, they are growing at a blazing rate because organizations started to see the power that can be unleashed from these systems.

Indeed hFOSS is dynamic and provides real-time information regarding a crisis area; these main characteristics are present in this type of system because its structure is a grassroots network that enables the activation of XBC and WOM. Moreover, they are continuously evolving, version after version, and this allows having improvements and new features. For instance, some hFOSSs now are connected with social networks and others are implementing new tools to verify the information coming from crisis areas.

To understand this system completely, in the next subchapters, we are going to describe Ushahidi, a hFOSS. We will describe its structure and how Ushahidi works and has worked in real crisis situations.

## **2.2 Ushahidi**

Ushahidi is not an hFOSS created by big international organizations or agencies but by a group of Kenyan techies; for this reason Ushahidi is not a strange mash up of English words but it is a Kiswahili word that means testimony or witness.

Ushahidi was created during the Kenyan postelection violence, precisely in early January 2008, with the objective "to harness the benefits of crowdsourcing information and facilitate the sharing of information in an environment where rumors and uncertainty were dominant" (Okolloh, Ory, 2009, pg65).

The 2007-2008 Kenyan crisis started after incumbent President Mwai Kibaki was declared the winner of the presidential election. Supporter of Raila Odinga, Kibaki's opponent, claimed the results were fraudulent. International observers confirmed the frauds that were perpetrated by both parties during the elections. After these facts, due to geographic and ethnic diversity, the two parties started an escalation of violence and riots all around the country. The government banned all on live media and censored the mainstream media; thus, local citizens and NGOs could not count on reliable and real-time information. Ory Okolloh, a Kenyan blogger, in response to the ban, asked people to send her information about riots that they were witnessing throughout the country. The response was out of expectations thus, she thought to build a website where people could send information via SMS or email, and then

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<sup>28</sup> **GNU**: is an acronym for "GNU's Not Unix." It is a Unix-like computer operating system developed by the GNU project. GNU is a complete Unix-compatible free software.

they could see them in a visual map. On 3 January 2008, Okolloh wrote in her blog a request addressed to Kenyan techies to help her in the website construction. A week later the website went live and this was the Ushahidi's genesis.

The motivations behind the idea of Ushahidi were to create a vehicle that would allow having real-time information and help individuals to figure out where the best intervention areas were. It was created also with the purpose to be a reminder for Kenyans to avoid in the future repeating the same mistakes. "Over 250 people began to use the new platform as a means of sharing information and some radio stations started using the website as an information source" (Okolloh, Ory, 2009, pg66). The website generated a lot of attention because academics and crisis managers began to see a big potential in this tool that it would be very useful in other crisis situations. Moreover, they argued that Ushahidi could be used as a yardstick regarding mass media information because it was an unbiased observer during the Kenyan postelection violence. Randy Newcomb, President and CEO of Humanity United<sup>29</sup> was among the estimators of Ushahidi; thus, through his organization he decided to give funds to Ushahidi because "in Kenya, Ushahidi demonstrated the power of geographically mapping real-time citizen reports and crisis-related information to help civilians avoid conflict" (Okolloh, Ory, 2009, pg67).

The developers of Ushahidi, with these funds started to rebuild the platform, in order to make it easier to use and customize by users and organizations with the final aim to satisfy every demands. After having developed an alpha, a beta, and a stable version, the Ushahidi team, in August 2011, has released the new platform's version called "Ushahidi 2.1 Tunis." Today, the Ushahidi platform has been used worldwide by activists, new organizations, and every-day citizens (Figure 2.2.1)

**Figure 2.2.1:** Map of Ushahidi's projects (Ushahidi.com)



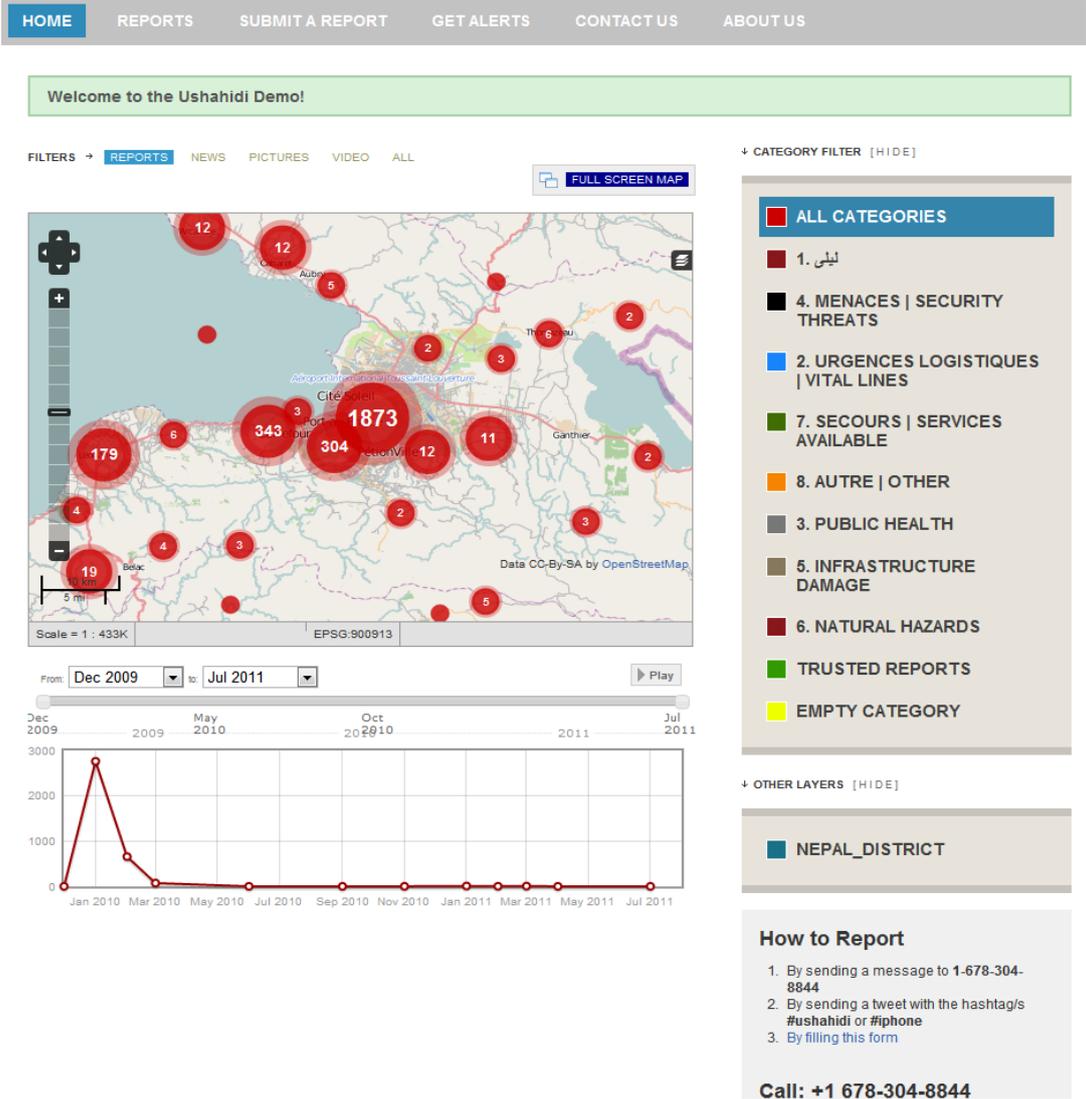
<sup>29</sup> **Humanity United:** is an organization dedicated to ending modern-day slavery and mass atrocities. Established in 2005, Humanity United works to build peace, promote justice, and advance human freedom in the areas of the globe where these ideas are challenged most.

All of these continuous improvements have been possible thanks to the community, which is growing year after year, and thanks to new funder like the Omidyar Network (ON), a philanthropic investment firm established in 2004 by eBay founder Pierre Omidyar and his wife. ON’s investment will enable Ushahidi to establish a Nairobi base with an expanded team; develop new technologies to enhance the platform and grow its partnerships with media organizations and NGOs.

Ushahidi is becoming the reference platform for other hFOSS, thus, we argue it is necessary, besides knowing its history, to know how it works and how the user interface is built to allow the spreading of information within and without the platform.

Ushahidi is a data aggregation tool that collects and analyzes information and data coming from multiple sources. Then it presents all the information on a geographic map with the support of a timeline (Figure 2.2.2).

**Figure 2.2.2:** Ushahidi’s user interface (Ushahidi.com)



The home page presents an overview of the real-time crisis situation. The interface and design are very clear and user-friendly. These are fundamental characteristics for the purposes of hFOSS' users. In fact, organizations and people, when enter in this type of website, have to understand immediately how it works because they are fighting against time. Just in few clicks, they must reach every page of the website and accomplish their tasks.

In the upper part of the home page, there is a contextual menu with many links that direct users to other subpages of the platform.

In the center is visible an interactive map which depicts the crisis area and all the events reported by users and represented by circles of different colors. The map is provided by OpenStreetMap Foundation<sup>30</sup> an international not-for-profit organization. The user can use filters to see on the map all the events or only news, pictures and videos. The events also are categorized; in the example of Figure 2.2.2 events are divided in ten categories (e.g. security threats, vital lines, public health) which also are divided in subcategories. For instance, the category "vital lines" is divided in seven subcategories: contaminated water, water shortage, power outage, shelter needed, food shortage, security concern and fuel shortage.

Users can also zoom in and zoom out the map and click on every circle, in a specific area of the map, to see the event's description.

Below the map, there is a timeline that describes the evolution of the crisis from the platform's activation day until the present day. It can be filtered to analyze events that have taken place during a specific time slot. It is also possible to watch the real-time information flow after having pushed the play button. Users, through the graphic representation, have a first overview of how long the crisis lasted and they can see the day in which there was the peak of events.

Moreover, the home page shows the different methods to report information about the crisis. For instance, in the example of Figure 2.2.2 there are four methods; users can choose to call or send a message to +1-678-304-8844, fill the form accessible from the platform or send a tweet with the #hashtag #ushahidi or #iPhone.

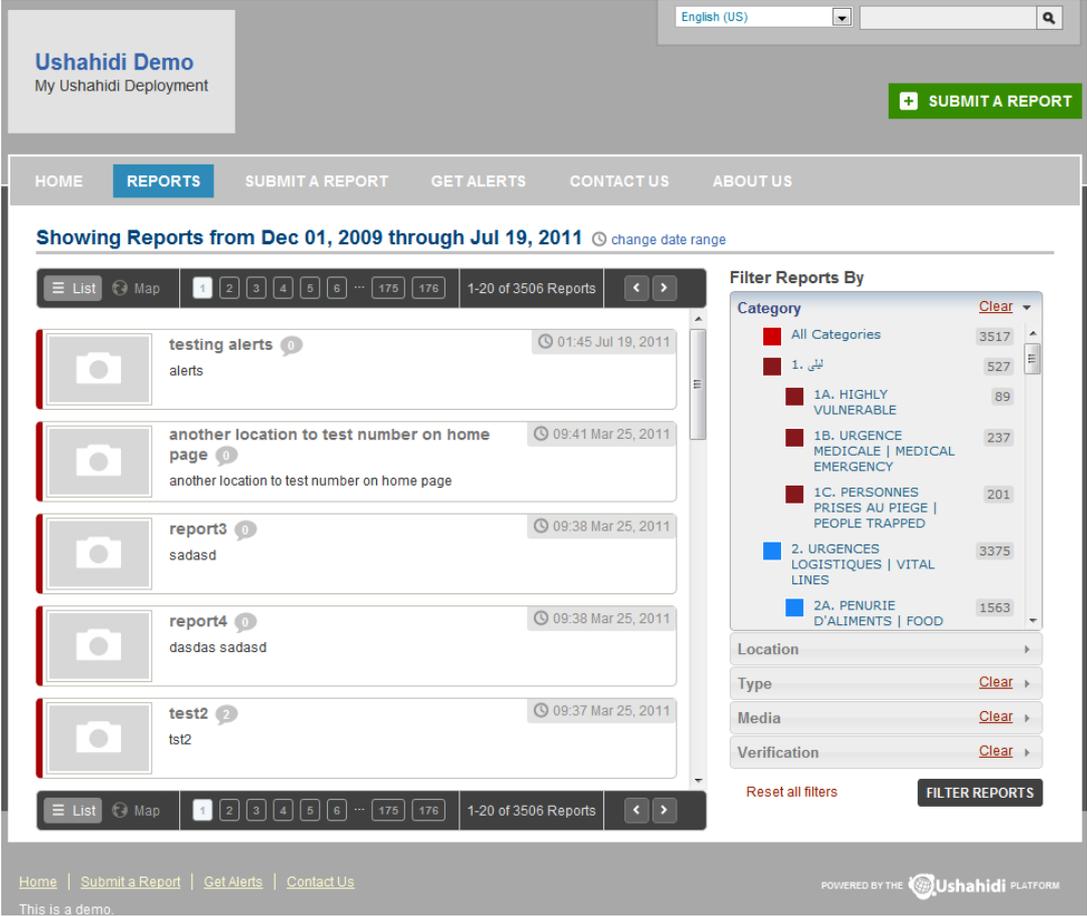
The reports page (Figure 2.2.3) is dedicated entirely to crisis information. It is one of the most salient features in the new release "Ushahidi 2.2 Juba", developed to satisfy the community's demand. The reports page's design follows the same rules of the home page. In the upper part of the page there is the same contextual menu and in the center is visible the list of reports

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<sup>30</sup> **OpenStreetMap:** is an initiative to create and provide free geographic data, such as street maps, to anyone. The OpenStreetMap Foundation supports, but does not control, the OpenStreetMap Project. It is dedicated to encouraging the growth, development, and distribution of free geospatial data and to providing them for anyone to use and share.

instead of the interactive map. On the right is presented the same menu of the home page with the different events' categories.

Figure 2.2.3: The reports page (Ushahidi.com)

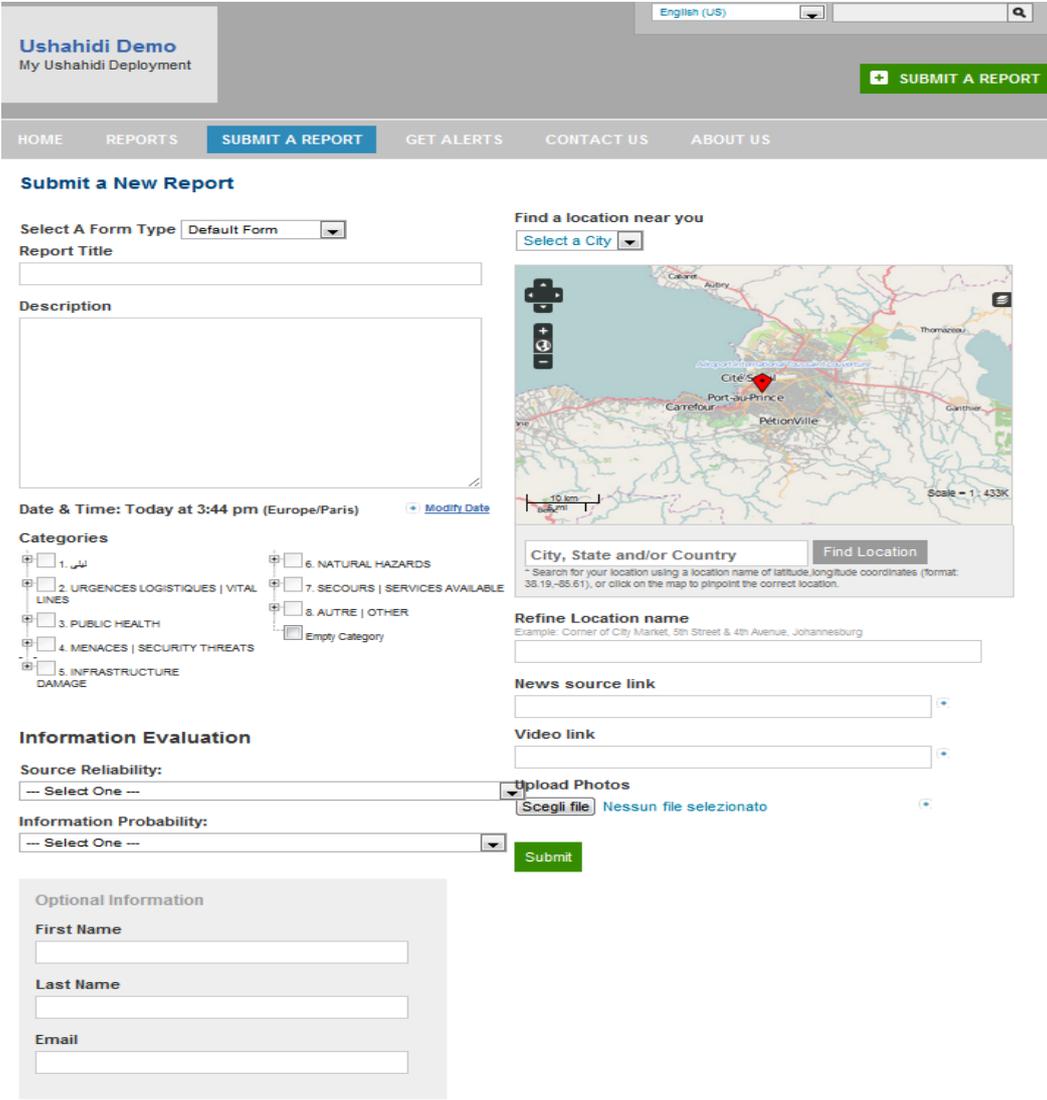


When users access the reports page, they can see reports ordered from the latest to the oldest one. Then the reports page allows users to filter reports using various combinations of parameters which are the following: report categories, date when reports were submitted, location radius (e.g. kilometers from a given point), the channel via which reports have been submitted (e.g. Web form, SMS, Twitter or email), media contained in the reports (e.g. videos, photos or new source links) and the information's verification status.

Users can also toggle between the list of reports and the map view to see in which area the event occurred. From the list, it is also possible to select an event and through another page see a description of it. In this page, we see the same characteristics of the report page but with additional information such as the level of event's credibility, if it is verified or unverified and comments submitted regarding the same event; those are extremely useful to have a better and more truthful picture of the situation.

The third page of the platform is dedicated to new reports submission (Figure 2.2.4). The entire page is a form that users can fill to report, for example, an episode of violence or a security threat.

**Figure 2.2.4:** The page to fill the form (Ushahidi.com)

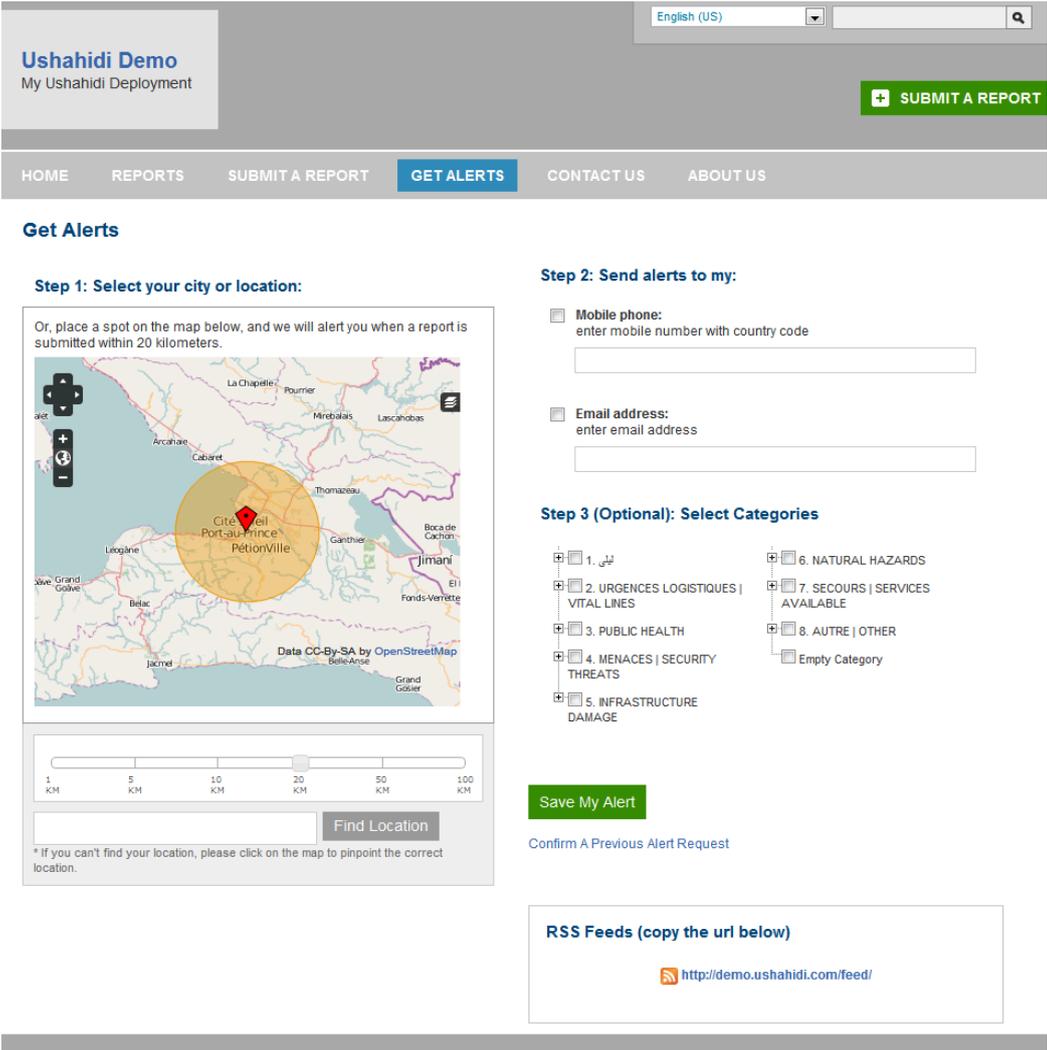


The first thing that users have to choose is the selection of the form type. The platform can be built to have different types of form that fit various users. For instance, Ushahidi may provide a form for NGOs, a form for rescue teams and a form for local citizens or the same form written in different languages. In this way, people do not spend time to fill useless information or unavailable to them. After having written the report title and the event’s description, users choose the event’s category. Then they have to fill the information evaluation regarding the source reliability and the information probability. The possible choices for source reliability are: “Yes, the source has direct access to information (witness or

actor),” “Yes, the source has access to information, but can be wrong,” “Yes, the source has no direct access to information, but is often right,” “Not always, but is often right,” “No, the source has (had) no access to information,” “I don’t know”. The possible choice for information probability are: “Yes, the information is confirmed by several independent sources,” “Yes, the information is not confirmed (yet), but is likely,” “Yes, the information makes sense,” “No, the information is surprising,” “No, the information is unlikely and may be disinformation,” “I do not know.” This information is fundamentals to try to have the maximum grade of objectivity during the crisis. To complete the form, users have to indicate the report’s location and upload multimedia files (e.g. new source link, video link, photos) if they have them. When a user has finished to fill the form it is only necessary to click the submit button; and optionally insert his first and last name and his email.

The last page that we are going to analyze is the get alerts page (Figure 2.2.5). It is vitally for local citizens and rescue teams that operate in the crisis area.

**Figure 2.2.5:** The get alerts page (Ushahidi.com)

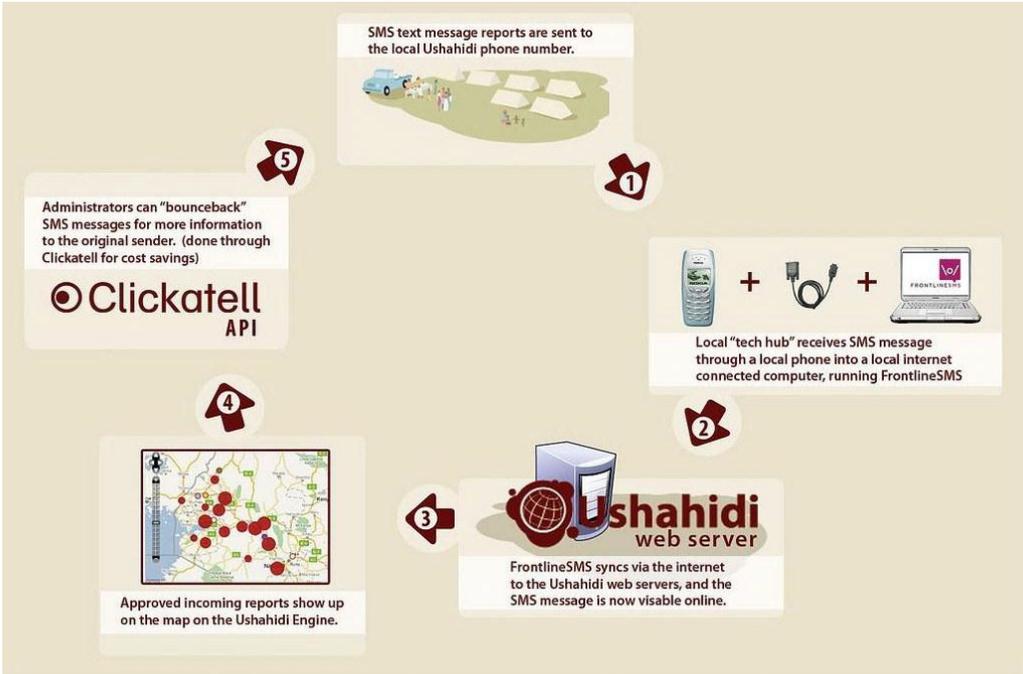


On this page, there are three steps to follow. In the first one, users have to select their city or location, placing a spot on the interactive map then they will be alerted when a report is submitted within 20 kilometers. The second step allows people to choose the mean to which will be sent every report. In the example of Figure 2.2.5, there are two means: mobile phone or email address. The final step is optional and permits to select a specific event’s category. Then if users want to save their alerts, it is only necessary to click the button “Save my alert”. Another interesting feature is the possibility to receive RSS Feeds<sup>31</sup> and be constantly updated regarding what happen within the Ushahidi platform.

The high number of reports submitted is due to the interface and design of the four pages that we described before and to the structure, which allows information flowing through the platform.

Ushahidi allowed people to send in reports via SMS, email, social networks (e.g. Twitter, Facebook) and on the website itself (Okolloh, Ory, 2009). These means permit the platform to be operative also in areas where internet is completely unavailable. In fact, only 32.7% of the world’s population has access to internet while there are 5.9 billion mobile subscribers representing 87% of the world population. In Figure 2.2.6 is shown how SMS are routed through Ushahidi.

**Figure 2.2.6:** SMS reporting and feedback cycle in Ushahidi (Okolloh, Ory, 2009)



<sup>31</sup> **RSS Feeds:** Really Simple Syndication, is a family of Web feed formats used to publish frequently updated works in a standardized format. An RSS document includes full or summarized text, plus metadata such as publishing dates and authorship.

A local citizen or a NGO send an SMS to the local Ushahidi phone number. Then the report is received by a local “tech hub” through a local phone connected with a computer running Frontline SMS which synchronizes with Ushahidi web servers. If the report is approved it is published within the platform, and administrators can send an SMS back to the source to provide more information.

To verify and filter real-time data Ushahidi relies on SwiftRiver, a free and open source platform which “offers organizations an easy way to apply semantic analysis and verification algorithms to different sources of information” (SwiftRiver, 2012, pg1).

Ushahidi uses, during the information flow, Frontline SMS, another free and open source platform that “converts a computer, connected to a GSM modem or mobile phone, into a two-way communications system. This system enables users to send, receive, and manage text messages. This makes it possible for people to contribute content to an online map even if they are not connected to the internet.” (Ushahidi.com, 2012). Thus, this tool is essential in areas where there are poor infrastructure or a lack of democracy.

The possibility to use both internet and mobile phones allows Ushahidi to be unbounded without losing any characteristics. For instance, it is possible to communicate through social networks like Twitter even if there is not an internet connection. In fact users can send tweets via SMS to a specific brief number (e.g. Italy: 4880804, Haiti: 40404, Iraq: 71117) which redirect SMS to Twitter servers.

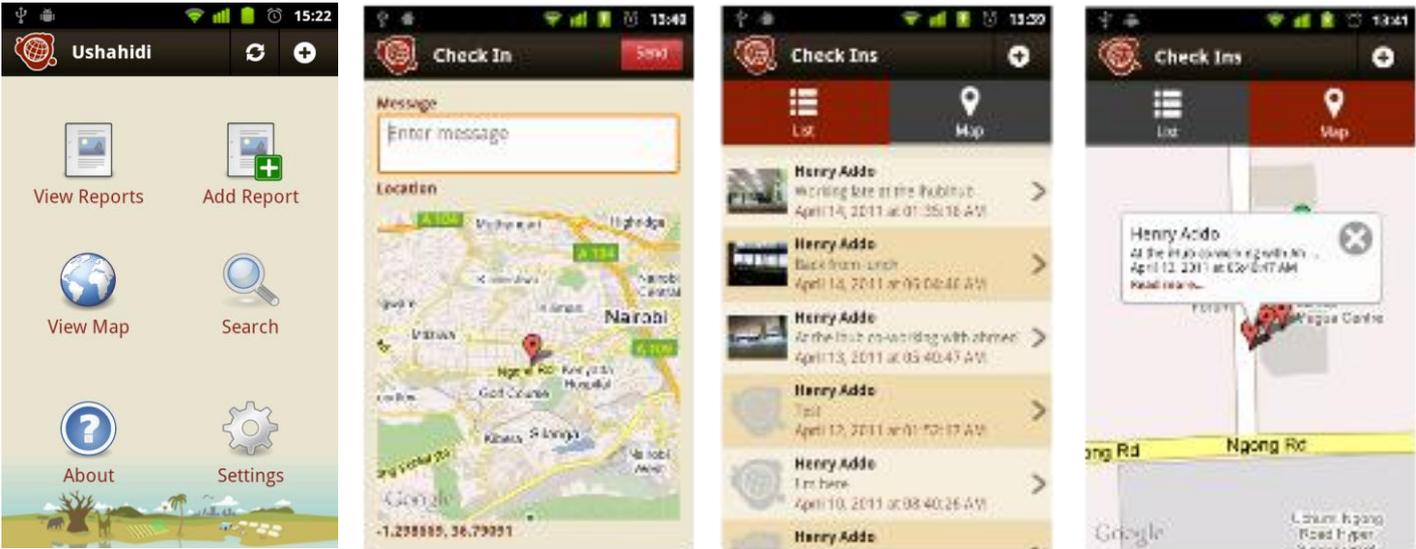
During 2011 Ushahidi has released the smartphone application for Android, Windows Mobile, iOS and J2ME platforms. It has very interesting features that allow a perfect integration of the platform user interface with the mobility guaranteed by a smartphone.

The application is translated into 22 languages by Ushahidi’s community and it has a white-labeling support, so users can “theme, configure and brand the app to fit a particular Ushahidi deployment” (Ushahidi blog, 2011).

The Dashboard (Figure 2.2.7) is user friendly and for every user is easy to navigate through the application. There are six main icons that satisfy all the possible uses. Some important features are related to GPS. For instance, the application can search for a deployment based on the device’s current location and users can use check-ins through which send a report to the Ushahidi platform. Another feature allows users to share reports via all social media, email, and SMS. It is also possible to embed attachments (e.g. videos, photos, documents) to the report; in this way, the information provided can be more easily verified. Users can “toggle between the report list and report map to view incidents near their location” (Ushahidi blog, 2011) and have real-time information. In the iOS application, the community enabled “the

discrete mode on shake” which allows users “to quickly flip the current view to a web browser hiding their current activity” (Ushahidi blog, 2011). This is very useful during election monitoring or during a civil war because a user can be arrested if he is caught while entering sensitive information.

Figure 2.2.7: Ushahidi’s dashboard (Ushahidi blog, 2011)



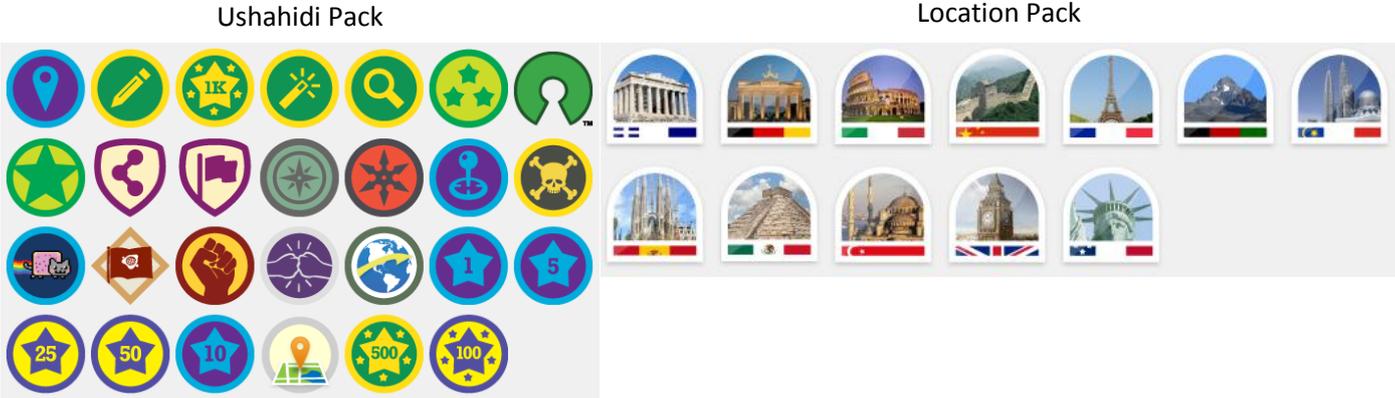
The mobile application is not the only main new feature of Ushahidi because in February 2012 Ushahidi announced “The Open Source Badges initiative”. The idea is to create and integrate within Ushahidi a playsource system (Horvath and Conner, 2010) that we described in subchapter 1.3. The initiative allows developers to include badges in their project and then award users. It is the same philosophy behind Foursquare<sup>32</sup>, a location-based social network for mobile devices where people earn badges by checking into various venues or by completing determined tasks. Ushahidi’s community broke down the badges into “badge packs.” Until now there are two packs (Figure 2.2.8); one is the locations pack which is “a simple grouping of badges that follow a travel theme, with badges highlighting landmarks from countries around the world” (Ushahidi blog, 2012) and the other is the Ushahidi pack, “a group of generic badges that the Ushahidi team has put together” as a sample for future deployments (Ushahidi blog, 2012). The license of all the badges is a “Creative Commons Attribution 3.0 Unported License”<sup>33</sup> which allows sharing, copying, distributing, remixing and adapting images. Users are free to use them in commercial work as well and attribution is

<sup>32</sup> Foursquare: for more information see [www.foursquare.com](http://www.foursquare.com)

<sup>33</sup> Creative Commons License: for more information see [creativecommons.org/licenses/by/3.0/legalcode](http://creativecommons.org/licenses/by/3.0/legalcode)

highly encouraged but not entirely necessary (CreativeCommons.org, 2012). This initiative stresses the importance for Ushahidi to have and maintain a community which is involved within the organization and which is free to improve and develop the organization itself.

**Figure 2.2.8:** Ushahidi’s badge packs (Ushahidi blog, 2012)



These badges can be awarded manually to users by the administrator or automatically by the platform. The objective is to motivate users and try to retain them. It is also a way to involve users, who are not directly involved in the crisis, to participate in the spread of information. For instance, an administrator may award the “10 star” badge to a user who has sent in 10 approved reports. All the badges earned are displayed in the user profile and other participants can see them. Thus, badges try to convey an idea of status enhancement; the user feels important because he think to be one of the people who contributed to the crisis’ resolution. Moreover, other participants seeing a user profile with a high number of badges, they believe he is a “good person” who is involved within the community with the main aim to help people.

In order to have a complete overview of Ushahidi we argue it is also important to analyze the Ushahidi profile within social media. Ushahidi has an own blog and it is present in Facebook, Twitter and YouTube. The Facebook page has 5.206 “I like it” and in this page are posted the most relevant news regarding the platform. The Twitter page has 23.573 followers and it is very similar to the Facebook page but the tweets are more frequent with the addition of a greater number of external links. The YouTube page is the least developed, it contains only 27 videos that have been watched only 19.143 times in 4 years even if they are very interesting. They tell about Ushahidi implementations and projects that involve the platform around the world. Eventually there is the blog, the true source of information. It is updated on a regular basis and every post is detailed and understandable by everyone. Ushahidi recently

has introduced a forum for the community and developers, where people can talk about different topics and exchange relevant information.

The organization created around the platform a very well structured environment that allows its diffusion and a great visibility not only within social media but also within mass media. After the first deployment of Ushahidi in Kenya, more deployments emerged. For instance, Ushahidi was used to map Swine flu, forest fires in Russia and Italy, floods in Queensland and in the Middle East and other crises. In the next subchapters, we are going to analyze two case studies; one regarding the Haiti earthquake and the other regarding the Libyan war.

### **2.3 Haiti earthquake**

On January 12, 2010, a 7.0 magnitude earthquake struck Haiti. The epicenter was just outside Léogâne, 25.6 kilometers west of Port-au-Prince, the Haiti capital. The most popular areas of the country were destroyed completely; “eighty to ninety percent of buildings collapsed in Léogâne, along with thousands more in Port-au-Prince and its surrounding areas” (Heinzelman and Waters, 2010, pg2). For instance, the presidential palace, parliament building, 28 of 29 government ministries, and the UN headquarters almost were destroyed.

The earthquake injured 300,000 people, killed more than 200,000 people and left over one million homeless (Rencoret et al., 2010). It was a tremendous disaster, which hit a country with a deficient and problematic political, economic, and social situation.

Haitian politics often have been violent starting with the civil war that led to Haiti’s independence in 1804. Then “Haiti has seen 55 presidents of which three were assassinated or executed, seven died in office, 23 were overthrown by the military or paramilitary groups and only nine completed full presidential terms” (Rencoret et al., 2010, pg9). In fact, the Democracy Index Rank (2008) shows Haiti is 110 out of 167 countries. Moreover, according to the Corruption Index Rank (2009), Haiti is 168<sup>th</sup> out of 180 countries because corruption is present at different levels of politics, generating mistrust among international community and among the local citizens.

The Haiti’s economy primarily is based on the informal sector; the private sector is small and fragmented and after the privatization of public services, the prices for public goods became more costly. Due to these factors 72.1% of the population lives below \$2 a day (2007). Haiti has also received much humanitarian aid (\$175 million in 2008) but according to the International Crisis Group (2009), funding has often been incoherent and unpredictable. Approximately 2.5 million lives in the capital; “this rapid urbanization had a negative impact

on the local environment and the country’s natural resources” (Rencoret et al., 2010, pg12). There is a high level of pollution, land erosion and an extremely high rate of deforestation (99%). The high level of environmental degradation exacerbated Haiti’s vulnerability to a range of natural hazards such as the 2004, 2007 and 2008 hurricanes and the 2010 earthquake. In Table 2.3.1, we can see the last four natural disasters and their effect on GDP and people. In seven years, Haiti has been hit by four natural disasters and due to its internal situation it never had the time to recover.

**Table 2.3.1:** Summary of the last four disasters in Haiti (PDNA, 2010)

Year	Event	Effect on GDP	Individual Affected	Dead
2004	Hurricane Jeanne	7%	300,000	5,000
2007	Hurricanes Dean and Noel	2%	194,000	330
2008	Hurricanes Fay, Gustav, Hanna and Ike	15%	1,000,000	800
2010	Earthquake	100%	2,000,000	222,500

Moreover, within the cities there is no recycling or solid waste collection system. The majority of the population lives in extreme poverty, in slums where crime and violence are ordinary; for example Cité Soleil is the largest slum in Port-au-Prince where between 200,000 and 300,000 people live.

From the previous analysis of the political, economic, and social situation of Haiti, we can understand the enormous impact and effects of the earthquake in this country and the difficulties of the international organizations in establishing and coordinating an efficient crisis response’s system.

On January 12, 2010 Patrick Meier was watching the news on CNN when he saw a breaking news regarding Haiti, which had just been hit by a devastating earthquake. Immediately he thought “I just couldn’t sit there and do nothing, so I reached out to Ushahidi’s lead developer, David Kobia, and we went live with the Ushahidi-Haiti map” (Heinzelman and Waters, 2010, pg6). After two hours, the crisis map (Figure 2.3.2) was deployed, and the Ushahidi team with the support of the volunteers at the Fletcher School of Law and Diplomacy at Tufts University began mapping the crisis live. They started to monitor all the news coming from social media and traditional media with the aim to provide useful information and insert them in Ushahidi with the GPS coordinates. Then to augment the visibility of Ushahidi, it was publicized throughout social media and traditional media to encourage people to submit new reports.

“By January 16, through a collaborative effort between the volunteer team at Fletcher, Frontline SMS, the U.S State Department, and Digicel, a system was set up that allowed people in Haiti to submit alerts directly through text message using their mobile phones (85% of Haitian had access to mobile phones). Reports could be sent free to the number 4636” (Heinzelman and Waters, 2010 pg7).

**Figure 2.3.2:** Ushahidi-Haiti map (Ushahidi.com, 2010)



The 4636 project allows local citizens to communicate directly with Ushahidi. The number was announced on Twitter and then publicized through WOM, local radio broadcasts, and posters. After few hours, messages began to come in at a rate of 1,000 to 2,000 per day but the majority of them were written in Creole, the spoken language in Haiti. The US Military had recognized the importance of the information contained within the messages to coordinate rescue teams but it needed that messages were translated in English. Robert Munro, a

graduate fellow at Stanford University, in collaboration with Ushahidi, decided to crowdsource the translation of messages. More than 1,000 volunteers coming from 49 countries helped translating 40,000 messages in the first six weeks. “They interacted in an online chat-room that served as a Q&A for the people newly joining the volunteer efforts, an avenue for volunteers to interact directly with the people coordinating the process, and a collaborative space for translators to work with each other” (Munro, Robert, 2010, pg3). Munro, Robert (2010) explained that in about 10 minutes after the reception of the message, it was translated and geo-coordinated. Then more than 100 students verified and approved the messages and if the message was unclear, they resent it to the person who submitted the report. This process allowed a two-way communication, fundamental to clarify the message’s truthfulness and remove redundancy; moreover, when messages contained many slang lexical items, which differs from region to region. For instance, here is the interaction between volunteers within the chat room (Munro, Robert, 2010, pg3):

*M: Hi, Wondering what is “akwatab”? Is this short for potable water? Thanks, M*

*K: “akwatab” is some kind of pill that you put in water so that it can sanitize it*

*R: @M – sounds like aquatab – can we more a bit more context to be sure...?*

Crowdsourcing and XBC were also essential to solve another big issue. When the Ushahidi team started to create the information clusters and insert them within the map, the team discovered that the maps of Haiti were approximate. For instance, some streets and buildings didn’t appear on the map, especially near and inside slums. Volunteers of OpenStreetMap “first traced older Yahoo! Maps and then traced satellite imagery declassified by the government and donated by DigitalGlobe<sup>34</sup>. As additional information became available, they integrated post-quake satellite imagery donated by GeoEye<sup>35</sup> and the World Bank” (Heinzelman and Waters, 2010, pg8). For instance here messages between volunteers regarding the map issue (Munro, Robert, 2010, pg3):

*D: I need Thomassin, A please*

*A: Kenscoff Route: Lat: 18.495746829274168, Long -72.31849193572998*

*A: This Area after Petition-Ville and Pelerin 5 is not on GoogleMap. We have no streets name*

*A: I know this place like my pocket*

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<sup>34</sup> **DigitalGlobe**: is a commercial vendor of space imagery and geospatial content. It was founded in January 1992 in Oakland, California.

<sup>35</sup> **GeoEye**: is a commercial satellite imagery company based in Herndon, Virginia and founded in 1992. It is the world’s largest space imaging corporation.

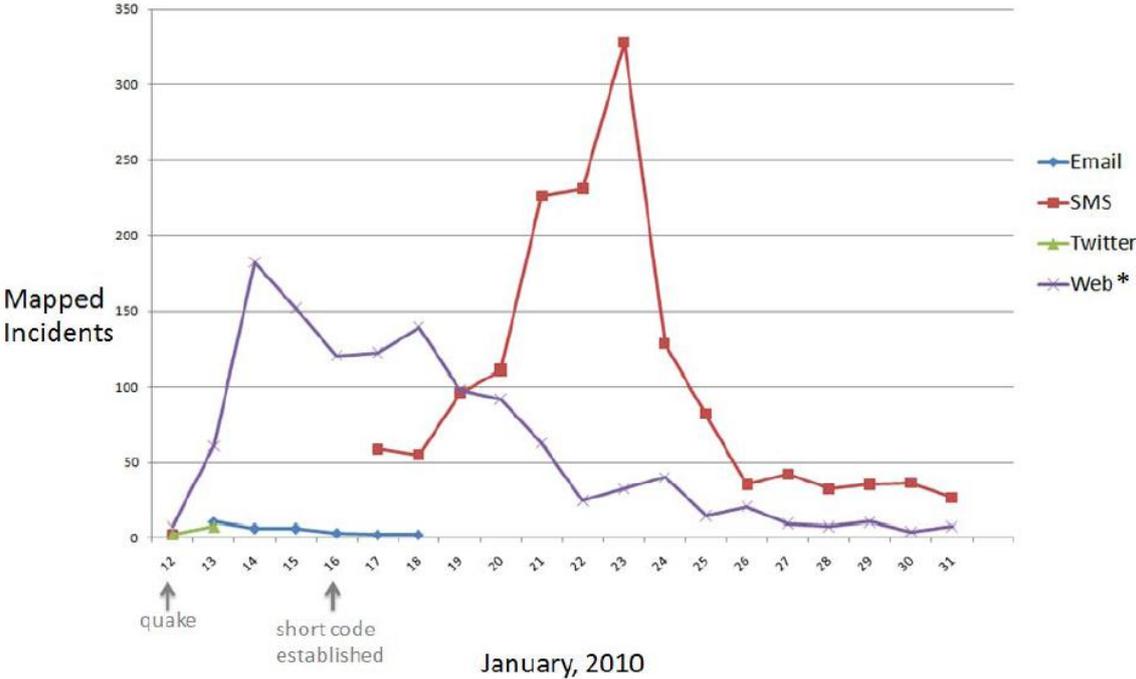
*Dalila: thank God u was here*

Thanks to them, all of the organizations had an extremely accurate map of the area. Thus they switched maps from Google Maps to OpenStreetMap. By February 2, Ushahidi sent representatives to Haiti to see the situation and talk with local people to have feedback; then it began the transition of the platform from the emergency phase to the reconstruction phase. In this way, Ushahidi has continued to provide support also when the majority of international organizations left the island.

During the crisis, Ushahidi was used by the U.S. Agency for International Development, U.S. Federal Emergency Management Agency (FEMA), United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA), the U.S. military, Marine Corps and Coast Guard (Heinzelman and Waters, 2010). Craig Clarke, an open source intelligence analyst in the U.S. Marine Corps, noted “In this postmodern age, open-source intelligence outperforms traditional Intel...The notion of crisis mapping demonstrates the intense power of open-source intelligence...When compared side by side, Ushahidi reporting and other open sources vastly outperformed traditional Intel” (Heinzelman and Waters, 2010, pg2). Craig Fugate of the FEMA Task Force wrote in a tweet: “The crisis map of Haiti represents the most comprehensive and up-to-date map available to the humanitarian community” (Heinzelman and Waters, 2010, pg9).

Eventually 40,000 to 60,000 reports were submitted, 25,186 SMS and social media communications were translated, resulting in 3,584 events that were considered relevant to appear in Ushahidi map. The reports were classified into 8 main categories (Emergency, Vital Lines, Public Health, Menaces and Security threats, Infrastructure damage, Natural hazards, Service available, Other) and 50 subcategories. The most part of reports were categorized under the label of Vital Lines (3284), followed by Service available (593) and Emergency (263). The sources were four (email, SMS, Twitter, Web) but “due to the way incidents were entered into Ushahidi all non-SMS incidents added after the first few days post-quake were added via the web and thus tagged as Web submissions” (Morrow et al., 2011, pg19). For instance, in Figure 2.3.3, all the information coming from Twitter after the 13 of January were embedded inside the web category and the same happened with emails. Thus, it is very difficult to estimate the percentage of information coming from social media compared to the total.

**Figure 2.3.3:** Sources of Ushahidi reports during the month of January (Morrow et al., 2011)



Moreover, classification was found to have a high rate of error (36%, Table 2.3.4), probably because the categorization and in particular subcategorization were too many to add a significant value and for this reason the majority of information were categorized as Vital Lines. The team of Ushahidi has discovered that people preferred to insert a report under a wrong category but with a lot of reports because they perceived that it would be easy for the organizations to find it and then activate a rescue team.

**Table 2.3.4:** Estimated rates of overall categorization error (Morrow et al., 2011)

Error type	Percentage of all reports (50 reports sampled at random)
Reports with incorrect category tag <sup>36</sup>	18%
Reports missing a critical category tag <sup>37</sup>	30%
Missing or incorrect category tag (overall error rate)	36%
Both incorrect and missing tags	6%
Reports with neither missing nor incorrect tags	64%

<sup>36</sup> **Reports with incorrect category tag:** the main category was correct but the subcategory was inappropriate

<sup>37</sup> **Reports missing a critical category tag:** wrong main category, which was clearly relevant based on the message title, description or comments.

However, 64% of all reports are correct and if we consider the situation in which the team and the volunteers worked and the appreciations by different international organizations and institutions, it was a great success. The Ushahidi platform, with its instant response to Haiti earthquake, reached its maturity. The platform showed the impressive potentiality of crowdsourcing, XBC and WOM and some limitations which have been improved in the subsequent Ushahidi's versions and we will discuss them in chapter 3.

Now we are going to analyze the use of Ushahidi during the Libyan civil war to demonstrate that Ushahidi is very useful not only during natural hazards but also during wars.

## 2.4 Libyan civil war

Due to its recentness, it is difficult to have a clear and objective image about the Libyan civil war. According to Benhalbylès et al. (2011) the Libyan civil war also referred to as the Libyan revolution “is neither democratic, nor spontaneous. It consists of an armed uprising in the Eastern part of the country, driven by revenge and rebellion, which attempts to pass itself off as part of the Arab Spring<sup>38</sup> which it in no way derives from.” However, Libya was an authoritarian regime with a tribal structure governed by the Colonel Muammar Gaddafi, and people in the last few years manifested more and more publicly a need of freedom and democracy thus, for other authors, Libyan civil war can be considered part of the Arab Spring at least at the beginning.

Libya declared its independence on 24 December 1951 and it became a constitutional and hereditary monarchy, “the United Kingdom of Libya” under King Idris. Then on 1 September 1969 a coup d'état against King Idris launched the first Libyan Revolution. The leader of the soldiers was Gaddafi an army officer named “the Brother Leader and Guide of the Revolution.” In 1973 Gaddafi announced a “Five Point Address” which meant the suspension of all existing laws and the implementation of Sharia<sup>39</sup> with an extensive surveillance system (50% of Libyans worked in surveillance for the Revolutionary committees) (Eljahmi, 2006). In 1977, Libya became “the Socialist People's Libyan Arab Jamahiriya,” the power passed to the General People's Committees; in fact, Gaddafi thanks to the previous reforms had a virtually unlimited power (Wynne-Jones, Jonathan, 2011). In 2008, the Colonel assumed the honorific title of “King of Kings of Africa” to boost his campaign for a United States of

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<sup>38</sup> **Arab Spring:** is a revolutionary wave of demonstrations and protests occurring in the Arab world that began on Saturday, 18 December 2010 in Tunisia.

<sup>39</sup> **Sharia:** Islamic law. It is the moral code and religious law of Islam. Sharia deals with topics addressed by secular law (e.g. crime, economics, politics) as well as personal matters (e.g. hygiene, prayer, diet).

Africa<sup>40</sup> and he reinforced his partnership with Italy, the former colonial ruler. On 15 February 2011, after demonstrations and popular movements in Tunisia and Egypt, the revolt started in Benghazi, an eastern Libya city. Then, in a few days, the rebellion spread in the whole country and within the capital city of Tripoli. On 27 February 2011, the National Transitional Council was established to administer the areas of Libya under rebel control. By March 2011, Pro-Gaddafi forces started a counterattack trying to conquer Benghazi, the rebels' capital. They arrived near Benghazi and started to bombard using planes and tanks. On 17 March 2011, the United Nations Security Council passed Resolution 1973 with a 10-0 vote and five abstentions. The resolution sanctioned the establishment of a no-fly zone and the use of all means necessary to protect civilians within Libya. (UN, 2011). It was the beginning of the end of the dictatorship. On June 2011, the International Criminal Court issued an arrest warrant for Gaddafi (Black and Smith, 2011) and in August, rebels entered in Tripoli and occupied Green Square, the symbol of Gaddafi's power. On 16 September, the National Transitional Council was recognized by the United Nations as the legal representative of Libya. Then on 20 October Muammar Gaddafi was captured and killed in Sirte and three days later, the National Transitional Council declared the liberation of Libya and the official end of the war.

The estimation of casualties during the civil war has been widely varied because there is not yet an independent verification. The Health Minister stated that at least 30,000 Libyans died, 50,000 were wounded of which about 20,000 serious injured (Laub, Karin, 2011).

The economic situation of Libya, before the civil war, was totally different from Haiti. For instance, Libya is ranked 64<sup>th</sup> in the Human Development Index (2011), so it is considered a country with a high human development compared to Haiti which is only 158<sup>th</sup>. The economy attracted three million immigrant thanks mostly to the Petroleum Industry. The public health service was free; thus, the male life expectancy at birth was 71.4 and female life expectancy at birth was 76.4 (UN, 2011). Moreover the education was also free and open to women. According to a report of the United Nation (2011), the 88.86% of the population above 14 was literate. In Egypt and Tunisia, the revolution started mostly because the majority of the population had no work (Benhalbylès et al., 2011); in Libya for the impossibility to have freedom of expression, association and assembly. For instance, during the civil war "on 8 March, Abdelnasser al-Rabbasi was released early from a 15-year prison sentence imposed for undermining the prestige of the Leader of the Revolution. Afterward he sent an email to

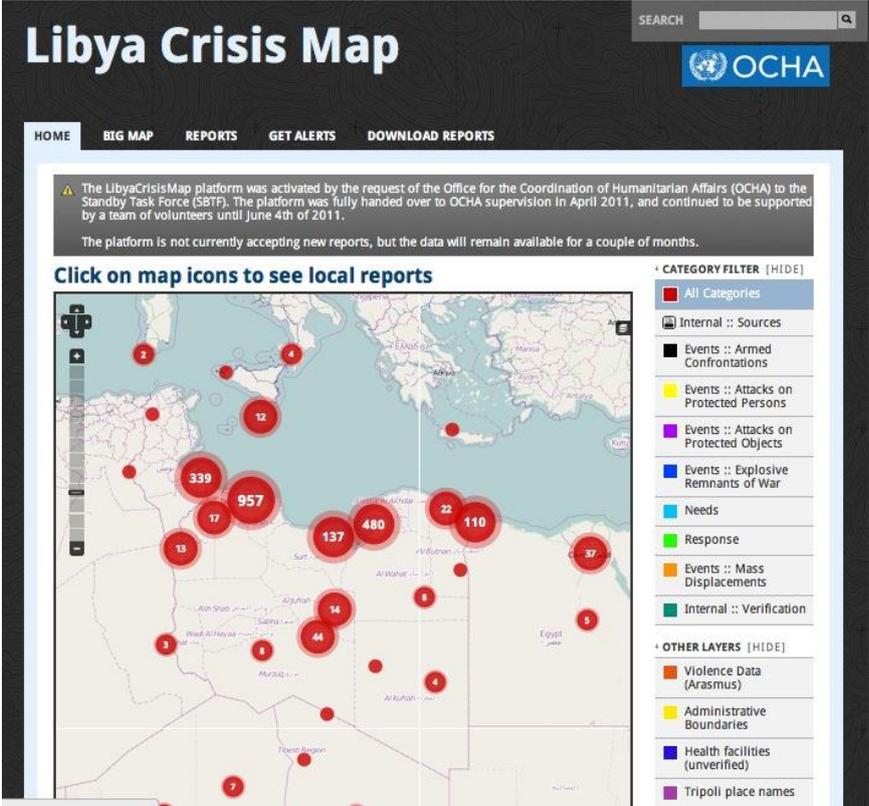
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<sup>40</sup> **Unites States of Africa**: is a proposed name for the concept of a federation of some or all the 55 sovereign states of Africa

the Arab Times newspaper held to be critical of the Libyan leader” (Amnesty International, 2011, pg211). The media were also restricted and largely state-controlled. Libya had no independent NGOs and demonstrations were illegal. “Libyan laws severely restrict freedom of association; Law 71 bans any group activity opposing the ideology of the 1969 revolution, and the penal code imposes the death penalty on those who join such groups” (Human Rights Watch, 2011, pg2).

On Monday, February 28<sup>th</sup>, after 13 days from the beginning of series of protests, Brendan McDonland, the head of OCHA’s Information Services Section (ISS) and Chair of the Inter-Agency Standing Committee’s (ISAC) Information Management Task Force, contacted the Standby Task Force (SBTF)<sup>41</sup> and Humanitarian OpenStreetMap (HOT) to join a conference call the following day with the objective to activate a crisis map to monitor the Libyan area. Patrick Meier was the representative of SBTF; during the conference he “committed SBTF to a one-week activation after which the situation was to be evaluated” (SBTF, 2011, pg8). Then an initial crisis map (Figure 2.4.1) was deployed, using Ushahidi, within 4 hours.

**Figure 2.4.1:** The Libya crisis map (Ushahidi.com, 2011)



<sup>41</sup> **The Standby Task Force (SBTF):** is a volunteer-based network that represents the first wave in Online Community Emergency Response Teams. The concept was launched at the 2010 International Conference on Crisis Mapping (ICCM 2010) to streamline online volunteer support for crisis mapping following lessons learned in Haiti, Chile and Pakistan, and to provide a dedicated interface for the humanitarian community (Standby Task Force blog, 2012),

For the first time, from the beginning, international organizations asked support to nonprofit platforms. After the deployments in Haiti, Chile, and Pakistan, they understood “the potential of online volunteer live mapping for better situational awareness” (SBTF, 2011, pg9). Moreover, OCHA needed the intervention of SBTF because UN had no presence inside the country, there were not any Information Management Officers (IMOs) in-country and no independent agency or journalists. The Libyan Crisis Map initially was private and password protected because information could be used not only by international organizations but also by the Gaddafi’s regime. On March 4 was also launched a public web site which differed from the private one; the reports were posted without description and with a 24-hour time delay. The SBTF started to monitor all the information coming from social network. Then, after the aggregation of information with those coming from traditional media and official reports, the SBTF “categorized, mapped, analyzed, and, to the extent possible, verified information about the evolving situation on the ground” (SBTF, 2011, pg9).

On March 28 the crisis map management was handed over to OCHA which had by then also established a field presence, necessary to manage the platform on the long run.

During the civil war, besides OCHA, 8 NGOs and agencies used the Libya Crisis Map, such as Save the Children, American Red Cross and the United Nations High Commissioner for Refugees (UNHCR).

The following bulleted list (SBTF, 2011) depicts the numbers regarding the Libya deployment until the final hand off to OCHA.

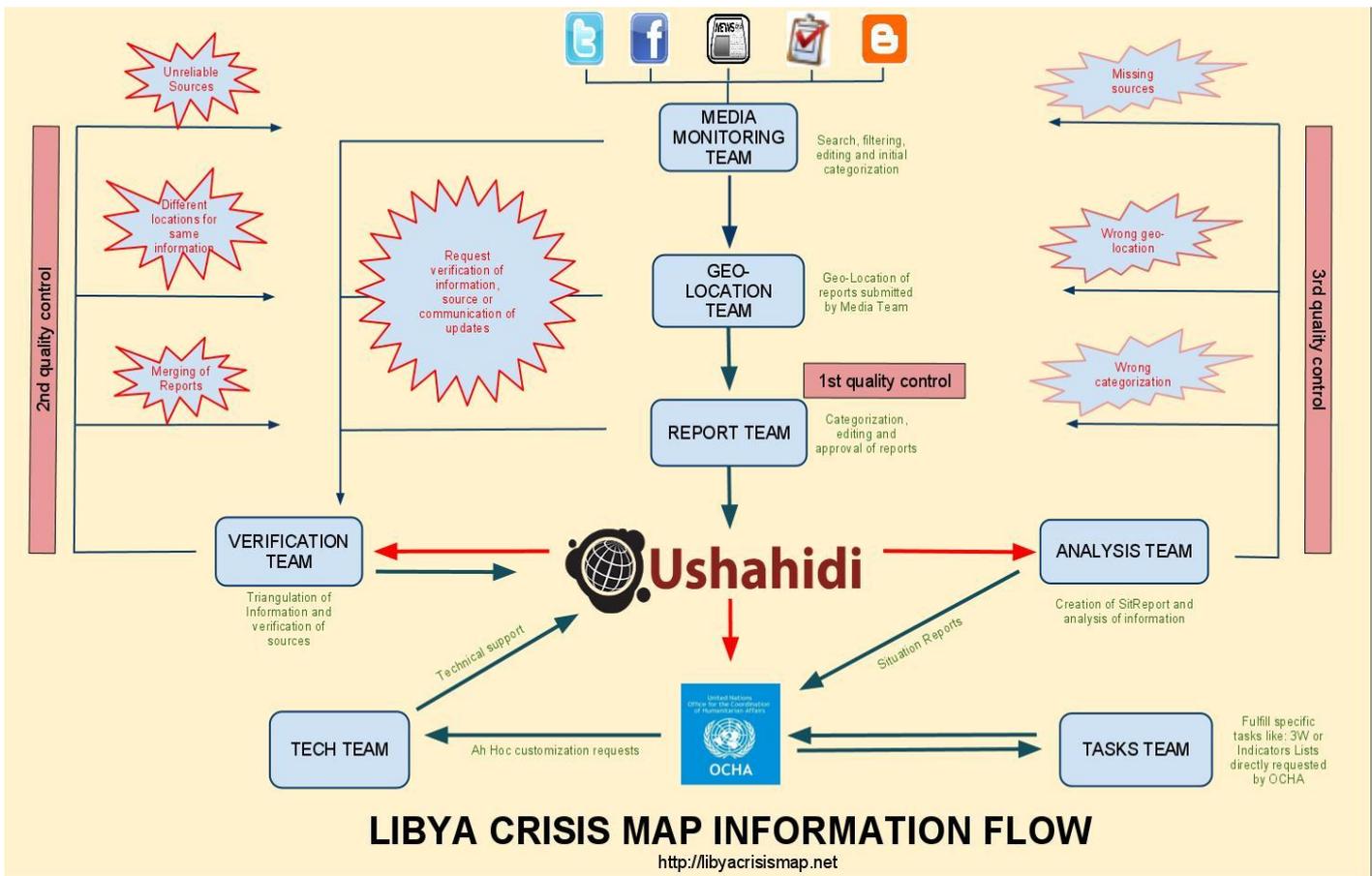
- 250 individuals participated in deployment
- 200 new individuals joined the SBTF during Libya deployment
- 566 is current overall number of SBTF members
- 16 team coordinators worked on the deployment
- 100 United Nations Volunteers (UNVs) were trained and joined the deployment

To understand the success of Libya deployment It is necessary to understand how the teams worked together to provide a continuous information flow (Figure 2.4.2).

The SBTF activated 8 teams: media monitoring team, geo-location team, reports team, verification team, tech team, analysis team, task team, and humanitarian liaison team.

Every team had specific tasks and members could mainly communicate each other through Skype and email, the same means used for the overall coordination. A Skype group for the team coordinators was also established. This model follows the same rules of Twitter’s information flow model (Figure 1.2.1.1).

**Figure 2.4.2:** Libya crisis map information flow (SBTF blog, 2012)



“The Tech team was activated immediately upon receipt of the request for support from UNOCHA” (SBTF, 2011, pg14). The team using Ushahidi platform deployed the Libya Crisis Map, first for private use and then for public use. During the crisis, the team continued to maintain the site and resolve minor and major bugs discovered by team’s members. For instance, the Tech Team “identified an information disclosure vulnerability in Ushahidi which made it possible for unapproved reports to be viewed through the search system, allowing hostile individuals to read the title and beginning description of reports” (SBTF, 2011, pg15). Then the team fixed the bug and notified the issue to the Ushahidi team.

The Media Monitoring Team was activated on the 1<sup>st</sup> of March. “The Libya deployment represented the largest SBTF deployment of media monitoring volunteers to date with one of the largest engagement and training of spontaneous new volunteers. From a coordination perspective, it was also one of the most complex” (SBTF, 2011, pg17). The Media Team could create reports within the platform but it could not modify previous ones or geolocate them because these tasks were managed by other teams. Some issues arose when On March 11<sup>th</sup> an earthquake of 8.9 magnitude hit Japan. Immediately started the deployment for Japan.

Thus the team had to split its time between the two deployments and the lack of directions entailed problems to monitor and process efficiently all the information.

The Geo-Location Team was also activated on the 1<sup>st</sup> of March. The main task was to georeferenced all the incoming reports. Due to security reasons, some reports that contained sensitive information (e.g. exit routes, refugee camps) were not mapped precisely. Moreover the description of several reports was too general or referring to the whole country. Thus the team did not know where to geolocate the events. “In the beginning of the deployment these were all mapped in Tripoli but after a while the location for general report was changed to the center of Libya. This resulted in a misrepresentation of the geographical distribution of reports in the user map” (SBTF, 2011, pg21). The team to avoid an event’s duplication and mistakes in the geo-location designed a guideline for new members, a system to check every report through 11 steps to follow.

The Report Team was activated the same day of the previous two. It received reports from the Geo-Location Team and its task was fundamental. In fact, the team was the last quality control pass before the reports’ publication. The Report Team had to manage all of the issues regarding incomplete or inaccurate reports coming from the Media Monitoring team and the Geo-Location Team. At the beginning, the team had to face another big problem; “the two coordinators were, for days, the only two members of the team, actively working on categorizing and approving reports, often working for 20 hours a day to keep up. With both coordinators located in the same time zone, it added an extra degree of difficulty in that there were times when both were off” (SBTF, 2011, pg22).

The Translation Team was managed by Robert Munro, coordinator also during the Haiti earthquake. The team had to translate all the information, which was mostly in Arabic, coming from citizens and local media. “For translation, local knowledge is vital as only people from the region will fully understand the exact vocabulary of the language variant, slang terms and nicknames for locations” (SBTF, 2011, pg25) but the first weeks, the team did not have the support of local volunteers because they were involved in the ongoing events. Then some citizens began to participate but when the map went public, they left because they were afraid of being killed and of reprisals against their families. Thus, it was a hard work since there were few Arabic speakers within SBTF.

The Verification team was activated for the first time during Libya deployment. Members of the team had to verify all the information coming from the Media Monitoring Team. “Information was considered verified if from a source with stringent verification standard. Reports citing unverified sources remained unverified” (SBTF, 2011, pg26). Every member,

after having analyzed the report, had to write a verification comment with his initials and the verification sources. One big issue was the amount of time that the team could spend to verify each report; “whether it was more important to verify one report that is more difficult or many reports that are clear-cut” (SBTF, 2011, pg27). The team decided to follow the needs of the organizations.

The Analysis Team was activated on March 4. The team had to produce situation reports<sup>42</sup> “contained a general summary of the situation highlighting emerging trends and then more detailed information on reports relating to events, to needs and to responses” (SBTF, 2011, pg 29). Every report was divided into three macro categories: events, needs, and responses. Within the report was stated the time at which data had been downloaded from the Ushahidi platform. The situation reports were attached to Libya Crisis Map and to OCHA’s mails.

The Humanitarian Liaison Team was in daily contact with OCHA and partners, providing situation reports included those coming from The Analysis Team. “These reports included information regarding the number of new reports mapped, updates on the customization of the map and new features, and action items for the next 24-48 hours and specific requests for feedbacks from OCHA” (SBTF, 2011, pg31). During the crisis, The Humanitarian Liaison Team recruited 100 volunteers coming from the United Nations Volunteer (UNV).

The Task Team was activated to map information on “Who” was doing “What” and “Where” (3Ws), it was a specific request made by OCHA. Then the team was involved in the collection and analysis of the Humanitarian baseline values indicators (e.g. World Health Statistics, Arab Human Development Report, UN data, etc.).

Now we are going to analyze the data and the reports provided by Ushahidi and SBTF.

The main events’ categories within the Libya deployment were 7: affected population, damage, needs, response (3Ws), incidents, media outlets on the ground and information sources. Like the other deployments, every category had subcategories. For instance, the category media outlets on the ground had 5 subcategories: radio station, TV station, news agency, blog, twitter source.

The Libyan map (Figure 2.4.3) showed all of the events happening in Libya, some of them fundamental to coordinate the rescue teams and the international organizations. The volunteers could see the evacuation points, all of the reports and the humanitarian response sources. The Analysis Team with all these information could provide a detailed situation

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<sup>42</sup> **Situation report:** for more information see <http://blog.standbytaskforce.com/libya-crisis-map-3rd-situation-report/>

report using the support of the interactive map, essential to summarize the data and easily readable by the OCHA members.

**Figure 2.4.3:** Evacuations points (SBTF blog, 2011)



According to the data downloaded from Ushahidi platforms, on 21<sup>st</sup> of February at 12.00 the first report was submitted within Ushahidi and the last one was submitted on 3<sup>rd</sup> of June at 1.58. During this period, 2197 reports were sent by SBTF volunteers, local citizens, and NGOs.

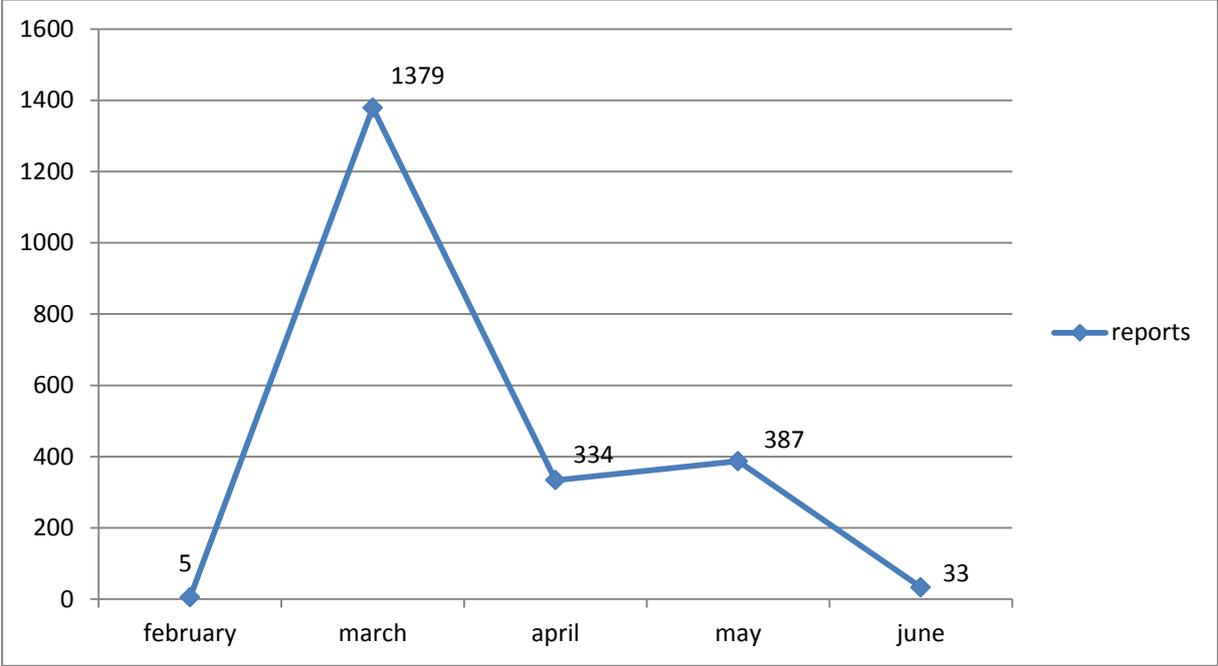
The Report Team approved 2103 reports, 95% of the total and the Verification Team verified 1320 reports, 63% of the total approved reports.

The majority of information regarded geo located news (286) and acts of violence. For example, 171 reports described “armed threat and armed attack,” 158 “attack on civilian object,” 153 “general combats” and 110 “civilian death or injury in armed confrontation.”

The Figure 2.4.4 depicts the number of reports submitted every month, starting from the deployment’s creation. We can see that the bulk of information was reached during the month of March when all the SBTF teams were activated and there were the most intense combats between rebels and Gaddafi’s soldiers. Then the number of reports decreased when the Libya deployment was handed off to OCHA. Moreover, other deployments were created to support Libyan citizens during the crisis and in the post-crisis. For instance the International

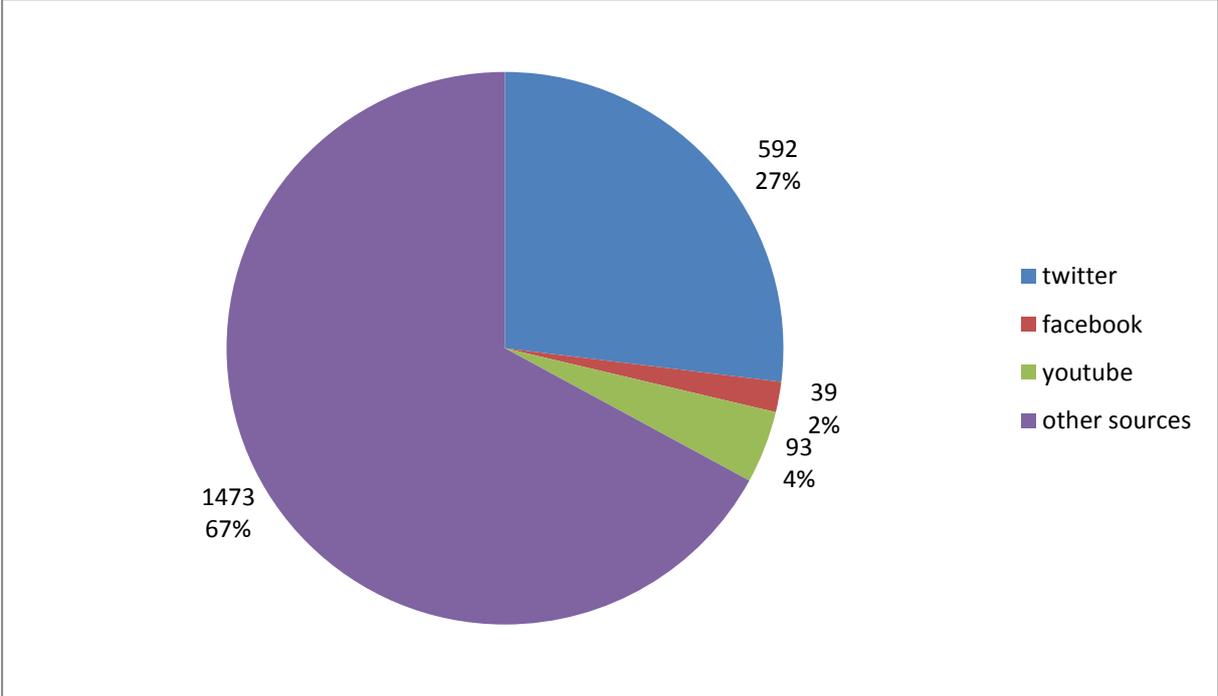
Organization for Migration (IOM) built an Ushahidi deployment (Migration Crisis from Libya) “to evacuate the thousands of stranded migrants in the country, and principally at the border with Egypt, Tunisia and Niger” (IOM, 2011).

**Figure 2.4.4:** Timeline of reports submitted



We also analyzed the different sources from which reports were sent (Figure 2.4.5).

**Figure 2.4.5:** Report’s sources



724 reports (33%) were submitted using social media. Twitter was the most used social network for the reasons that we explained in subchapter 1.2.1. 592 reports (27%) were sent through it. It is also important to state that this percentage may be higher. As we saw in the Haiti deployment (subchapter 2.3) the label “other sources” contains different sources: media, SMS, web etc. Due to the great amount of work and to the small number of people, the SBTF teams may have categorized some tweets as SMS or web.

For these reasons, it is very difficult to have a completely certitude regarding the data results. This is also confirmed in the SBTF document (2011) where it is written that “current training materials related to categorization need to be updated with clear descriptions, examples and guidelines in order to minimize mistakes and miss-categorization. This requires the publication of a coding handbook for categorization” (SBTF, 2011, pg6).

The case studies of Libya and Haiti have demonstrated how Ushahidi platform works in strictly relation with social networks to improve crisis response and crisis information management.

Thus, in the next chapter we are going to discuss if our two hypotheses are verified according to the analysis of the two case studies and if there are some issues with the utilization of these new means.

## CHAPTER 3

### 3.1 Hypotheses verification

In chapter 1, we saw that the two hypotheses have been verified by the theoretical base. The analysis of the different authors' contributions demonstrated that social media in nonprofit platforms increase the speed (H1) and the efficiency (H2) in the resolution of a crisis in comparison to traditional means.

In chapter 2, we described how the Ushahidi platform works and after that we proposed an analysis of two of the most important and emblematic deployments of Ushahidi regarding the Haiti earthquake and Libyan civil war.

We state that the two hypotheses are also empirically verified.

It is necessary to stress that it is the strictly integration between the nonprofit platform and social media, which allows hypotheses' verification otherwise we have to deny them.

During a crisis, social media, in particularly Twitter, are an extremely important source of information up-to-date. But they still remain only information, if they are not filtered through a platform, which analyses and transforms them in useful knowledge for the NGOs and rescue teams. In the same way, the platform without the information coming from social media loses his potential. For instance, during the Haiti earthquake and even more during the Arab spring, a large part of information spread through Twitter. For this reason, some traditional media renamed the Arab spring, the Twitter revolution.

The UN recognized the important connection that exists between social media and nonprofit platform writing this tweet: "social media is critical for humanitarian work and now you can see why. Crisis map of Libya is now public."

The first hypothesis (H1) is verified because when we described the two cases, we saw that a deployment, using Ushahidi, has been built in few hours after the earthquake in Haiti, and immediately it started to gather information from social media and other sources. The platform allowed having a general overview of the crisis and thanks to it, the international organizations have been able to start the operations of rescue.

William Craig Fugate, the Administrator of the Federal Emergency Management Agency (FEMA) wrote this tweet: "crisis map of Haiti represents the most comprehensive and up-to-date map available to the humanitarian community." The increasing of speed in the resolution of Haiti's crisis, permitted by social media within a nonprofit platform, was recognized by all institutions. Thus, when riots broke out in Libya, another deployment was activated not only

by voluntary initiative of SBTF but under OCHA's request. It was another big success. Thanks to the SBTF, all the international organizations were able, in few hours, to start coordinating the humanitarian operations that would not be possible without the deployment because, as we saw, UN had no presence inside the country.

The second hypothesis (H2) is also verified and the following statements are proofs of the improved efficiency in crisis resolution.

Josette Sheeran, Executive Director of the United Nations World Food Programme (UNWFP) tweeted "Excellent Libya Crisis Map can help UN and WFP plan humanitarian food, also for borders (Tunisia, Egypt)."

OCHA said regarding the Libya deployment "as a volunteer community you have helped us gather more data in 4 weeks than a single person could have done alone in 3 months, working 20 hours per day."

The factors that determined a better efficiency in the two crises were: the presence of a solid network of volunteers, the use of XBC and crowdsourcing and the spread of information through WOM. We have discussed all these factors in chapter 1.

During the Libyan civil war, we saw the real capabilities provided by a well-managed network of volunteers (SBTF). It was a global volunteer project where people were working from all the continents and many time zones of the planet. The internal division in sub teams for specific tasks allowed reaching better and more efficient results. Furthermore, the volunteers had been trained and the majority of them were skilled individuals with real professional expertise.

An example of the use of XBC and crowdsourcing was the SMS and tweets translation during the Haiti earthquake. This task was accomplished only thanks to volunteers recruited from all over the world. Otherwise, due to the enormous rate of coming messages, it would not be possible for a small team, belonging to an organization, to manage them and provide a good translation in less than 10 minutes.

Another factor that augmented the efficiency was the capitalization of the WOM communication by Ushahidi. The platform, in both crises, received a lot of information coming from Twitter. As we analyzed in subchapter 1.2.1, Twitter with its unique characteristics and functions (@at and #hashtag) allows information spreading.

Thanks to Twitter, local citizens and NGOs retweeted critical messages using specific key words, in this manner the Ushahidi team could easily detect and verify the information sources.

As we said before, these facts allow us to state that the two hypotheses are verified but we found also some limitations and issues that we must arise; thus, in the next subchapter we are going to explain them.

### **3.2 Limitations and issues regarding Ushahidi and social media**

After the analysis of the literature review and discussion of the two case studies, we discovered that the integration between Ushahidi and social media might generate some problems not yet solved. Furthermore, other issues can be found within the single mean. These limitations should be known by the Ushahidi team and community and by the international organizations. Thus, they can try to solve them or at least manage them and be aware of their presence when they start a new deployment.

We found four main issues:

- Verification and truthfulness of information
- Information overload and technical problems
- The majority of Ushahidi's deployment are focused on high profile cases
- Social media may stop revolutions

#### **3.2.1 Verification and truthfulness of information**

According to the American Heritage Dictionary of the English Language, verify means “to prove the truth of by presentation of evidence or testimony; to determine or test the truth or accuracy of, as by comparison, investigation or reference.

The problematic regarding how the information should be verified is a main issue dating back to the foundation of Ushahidi.

David Kobia, one of the people behind the development of Ushahidi, said that the need for verification emerged three days after the launch of the web site.

“There was a degree of naivety when you start with five reports, but as you get inundated with 500 text messages, then you think that there needs to be some verification process in place. Getting verified information becomes really critical during crises like Kenya. This was really problematic because people were sending text messages to start rumors” (Ford, Heather, 2011, pg2).

After the Kenya deployment, the other deployments have adopted different methodologies to verify information, adapted to the crisis and the environment. The most common method used is to confront the information coming from SMS and Twitter with those coming from mainstream media. Apparently, this method is the easiest one and the most objective but in the circumstances where it is applied, two issues arise. When a natural disaster or riot hits, the breaking news published by mainstream media, the most of time are labeled as coming from an unverified account. Thus, in the first hours, the quality of information is uncertain and misinformation can easily spread and it may compromise the whole operation.

To avoid this problem information can be compared and integrated with those coming from NGOs or international organizations. In this way, the risk of misinformation is reduced.

The other issue is related to the gathering and analysis of information by the deployment team. As we saw in the case study of the Libyan civil war, the SBTF had different teams that dealt with these tasks. However even the SBTF, in the first days, had to manage an enormous amount of information with a small number of members and within the Verification Team some difficulties emerged regarding the definition of approved and verified report.

“The deployer becomes a critical part of the trustworthiness of the platform” (Ford, Heather, 2011, pg7). It is necessary to have a guide that defines exactly when a report could be considered verified or approved. In this way, we can avoid misunderstandings and the possibility that the entire deployment may be considered untrustworthy and used as a weapon by some regime or organizations with opposite interests.

Furthermore, it is important to have a sufficient number of volunteers to prevent situations where in the most critical hours; only a few of them are available.

Ford, Heather (2011) describes another method of verification used by The NextDrop project,<sup>43</sup> which aims to track water availability in India. The deployment team sends a message to people asking if the water is available and they have to reply yes or no. “The information becomes verified when a statistically significant sample is reached. NextDrop is making use of people on the ground who have the authority to verify information in a way that would be impossible for one small organization to do centrally” (Ford, Heather, 2011, pg7). This is a very interesting solution to verification but it is strictly correlated to the grade of participation of local citizens. In subchapter 1.3, we analyzed the importance of some type of compensation to retain the crowd and until now, it is not yet implemented in the NextDrop project. We think it is the explanation for the problems described by COO Ari Olmos “We

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<sup>43</sup> **The NextDrop project:** provides households with accurate and timely information about local piped water delivery, over cell phones already widely in use in India. For more information see: <http://nextdrop.org/>



Figure 3.2.1.1 depicts term clouds that are composed by terms used during the Chilean earthquake and where the size of each term is proportional to the number of concurrences each term registers in the authors' dataset.

The first day the most recurrent terms were “tsunami,” “death” and “deceased.” These three words were the perfect synthesis of the day; in fact, a tsunami hit Chile minutes after the quake, which increased the number of death people.

The second day “missing people” was the most recurrent word “as a consequence of the earthquake and the tsunami of the previous day” (Mendoza et al., 2010, pg75).

We can state, after having described the three methods used to verify information, that everyone has advantages, disadvantages, and intrinsic limitations. Organizations that want to start a new deployment have to know the different methods and according to the crisis that they are facing, adopt the method, which suited more for their final objective.

We totally agree with Meier Patrick (2011, pg19) “while wrong data can cost lives, this does not mean that no-data does not cost lives, especially in a crisis zone. Information is perishable so the potential value of information must be weighed against the urgency of the situation. Perhaps the question is ultimately about tolerance for uncertainty-different organizations will have varying levels of tolerance depending on their mandate, the situation, time and place.”

### **3.2.2 Information overload and technical problems**

On 24-25 September 2010, the VizCenter (Immersive Visualization Center) of San Diego State University hosted a virtual humanitarian assistance and disaster relief (HADR) event called “Exercise X24.”

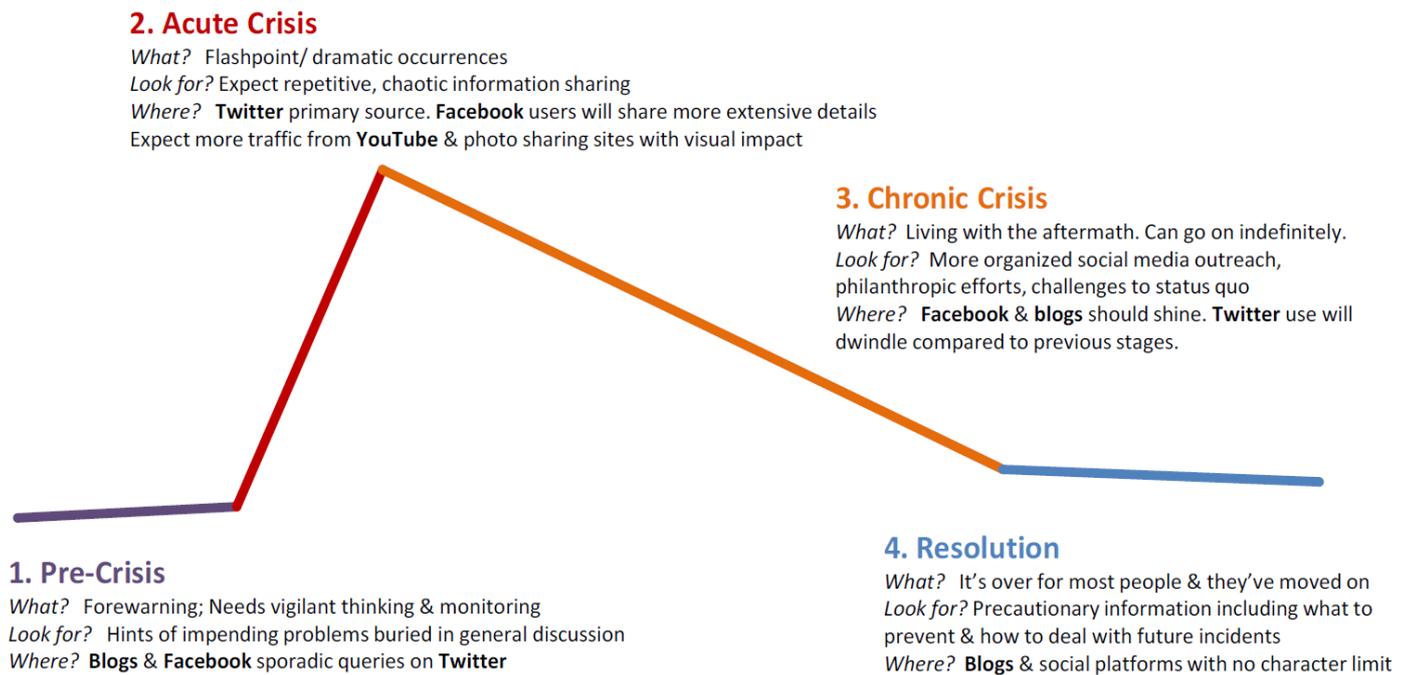
X24 involved over 12,500 people from 79 nations and 90 U.S. government, non-government organizations and public-private partners in a collaborative environment using crowdsourcing, social media and cloud computing applications (X24 website, 2012).

During the exercitation all social media were monitored and as expected in the acute crisis (Figure 3.2.2.1) there was an overwhelming response that caused information overload.

The pattern of the Exercise X24 is virtually equal to those of the two case studies. The phase of acute crisis is the most critical in term of quantity of information that has to be processed by the deployment team but we cannot underestimate the phase of chronic crisis that may also create some problems to the organizations.

During the third phase, the amount of information decreased but at the same time, the quantity of information regarding various topics starts to increase.

**Figure 3.2.2.1:** Social media during the 4 stages of crisis (Hessert et al., 2010)



These two phases can only be managed if the deployment team has a relevant number of members devoted to monitoring and analysis of information. Moreover, volunteers have to be trained, able to categorize different type of information and work in a stressful environment, fighting against time. For instance, over 4,500 posts were published in a 48-hour span of Exercise 24 (Hessert et al., 2010).

Today, to handle the tidal wave of information coming from social networks and traditional media, some deployment teams have started to use data aggregation tools alongside volunteers. Hessert et al. argue that thanks to data aggregation tools “the information gathering is time-sensitive, easily filtered and mindful of trends in the making” (2010, pg10). Thus, these tools may be a solution to reduce information overload, which until this very moment remains a big issue.

Another limitation that we have to face using Ushahidi and social networks regards the technical problems that may occur and destroy the whole deployment.

When the earthquake hit Haiti, “70% of the cell phones towers in Port-au-Prince had been destroyed in the disaster. Without electricity, people in Haiti managed to keep lines of communication open by recharging their phone batteries on gasoline generators” (Heinzelman and Waters, 2010, pg7). Luckily, the cell phones towers “were quickly repaired and mostly back online before the 4636 number was operational” (Heinzelman and Waters, 2010, pg7).

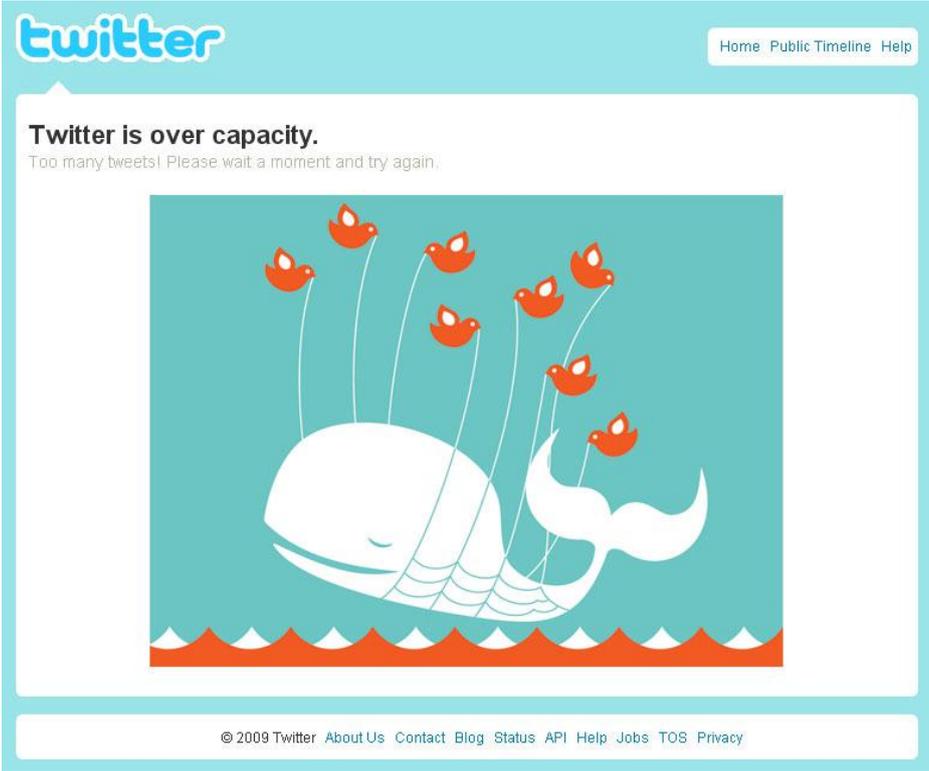
These problems are not unusual when we are facing a natural hazard and they are more evident when we start a deployment to monitor a conflict. In this particular case, the government can shut down all the communication lines and our deployment become totally useless if we do not have other mean to avoid “the invisible barrier” as happened in Egypt, Syria and Libya.

Above these issues, which are intrinsically related to the environment where organizations work, there are also technical problems within Ushahidi platform and social networks.

As we saw in subchapter 2.4, the Tech Team of SBTF found different bugs within Ushahidi platform, which put in danger the privacy of users and the possibility of sensible information leak by Libyan government.

The millions of tweets posted the first hours after Haiti earthquake overwhelmed the capacity of the Twitter’s servers, causing the social network’s paralysis (Figure 3.2.2.2).

**Figure 3.2.2.2:** Twitter is over capacity (Twitter.com)



One of the major sources of information of Ushahidi, for some hours, became unavailable and people had to use different means to communicate.

For a deployment team the majority of these problems cannot be resolved because are out of its reach. Organizations cannot avoid the shutdown of the communication lines by the government, as they cannot manage the servers’ capacity of Twitter.

Thus, if these problems occur, the only think that the team can do is to think and adopt new strategies to maintain alive its deployment because these issues are rooted within the structure of Ushahidi and in the way it works.

### **3.2.3 The majority of Ushahidi's deployments are focused on high profile cases**

From the first deployment of Ushahidi in 2008, the platform grew and now counts several projects around the world. Nevertheless, until now the major deployments regard high profile cases such as the Haiti earthquake or the Libyan civil war.

In the last two years, some small projects have started giving good results but they struggle to survive. The main reason lies in the fact that a deployment is principally sustained by volunteers. It is necessary that the number of members is sufficient to manage all the tasks and allows the redundancy of roles; thus, if a member cannot participate for the whole time, another member can easily substitute him because he is trained and has similar skills.

The issues are not only internal but also external. In fact, if no one knows the deployment it is totally useless and in a short time disappears.

The support of international organizations or local governments is one of the main catalysts to improve the degree of knowledge of the local population and even international volunteers regarding the deployment that is still a new mean of communication not easily understandable by people used to traditional means.

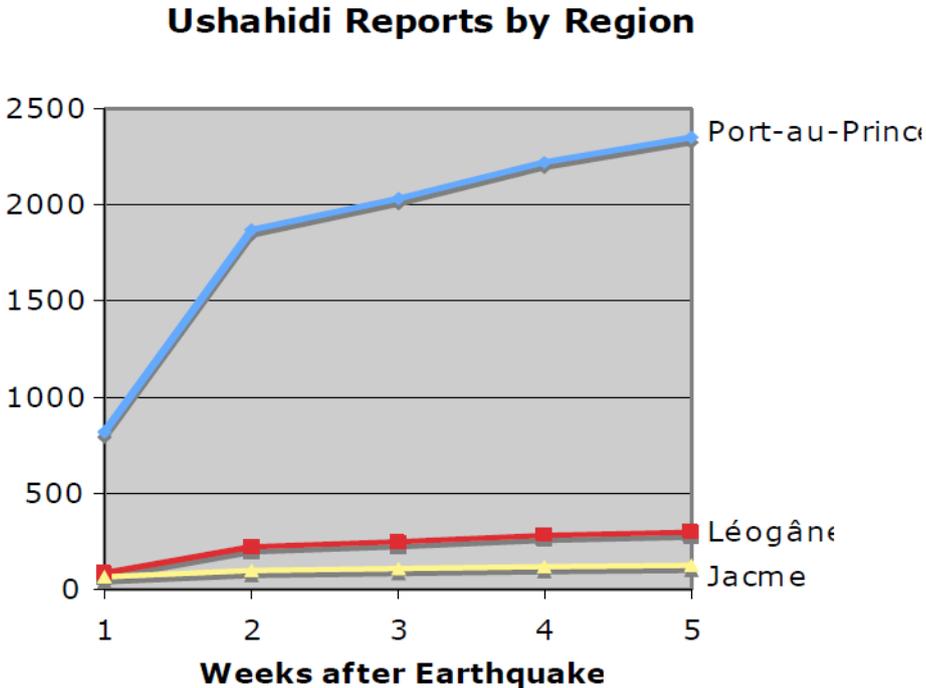
We argue this the reason why the majority of deployments are focused on high profile cases.

This limitation, unlike the previous ones regarding technical problems, can be overcome if the deployment team takes the precautions that we saw before and comprehension of this new mean spreads among people and in particular among new generations.

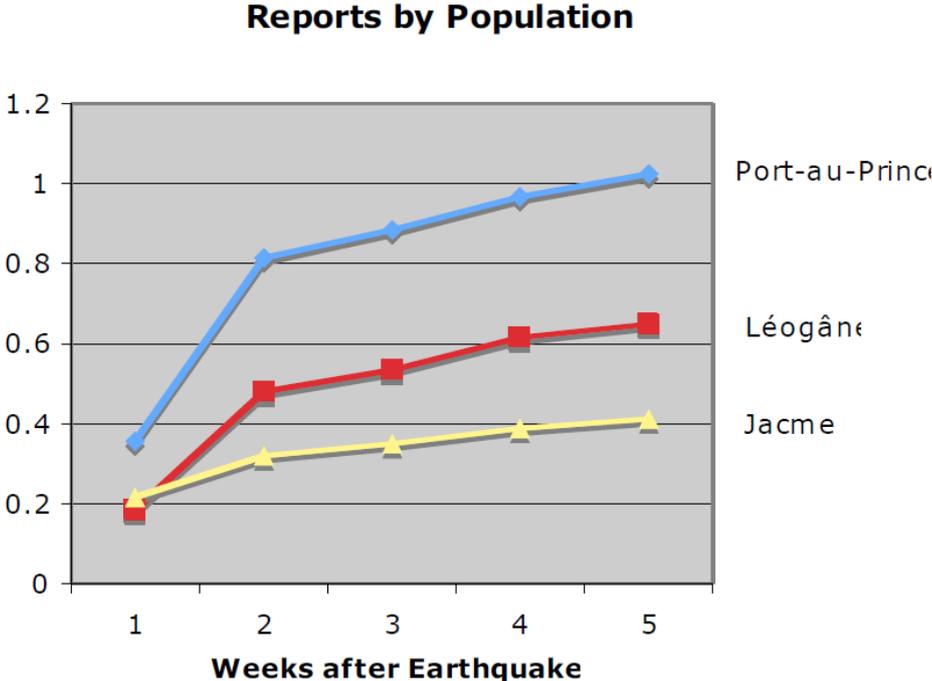
The disparity between high and low profile cases is also present within the single deployment. Johnson, Grady (2010, pg4) states that during the Haiti earthquake “overreliance on crowdsourced reporting drew undue attention to certain regions, leaving other vulnerable areas underrepresented.”

The author describes the case of Léogâne a city that was completely destroyed by the earthquake. “Of its 181,000 inhabitants, nearly 10,000 were killed, and many thousands more were left homeless” (Johnson, Grady, 2010, pg8). He compares the number of reports submitted in Léogâne with those submitted in the capital Port-au-Prince in absolute terms (Figure 3.2.3.1) and then the number of reports per thousand persons (Figure 3.2.3.2).

**Figure 3.2.3.1:** Ushahidi reports by region (Johnson, Grady, 2010)



**Figure 3.2.3.2:** Reports per thousand persons (Johnson, Grady, 2010)



The Figure 3.2.3.1 clearly depicts that the number of reports submitted in Port-au-Prince far outweighs the number of reports submitted in Léogâne. For instance, in the 5<sup>th</sup> week the number of reports coming from Port-au-Prince were 600% more numerous in comparison to those coming from Léogâne. This result cannot be explained only by the fact that the capital is more populated than the coastal town or by migration because the difference is also visible

in Figure 3.2.3.2. By the 5<sup>th</sup> week, the disparity in reporting had persisted also considering reports per thousand persons.

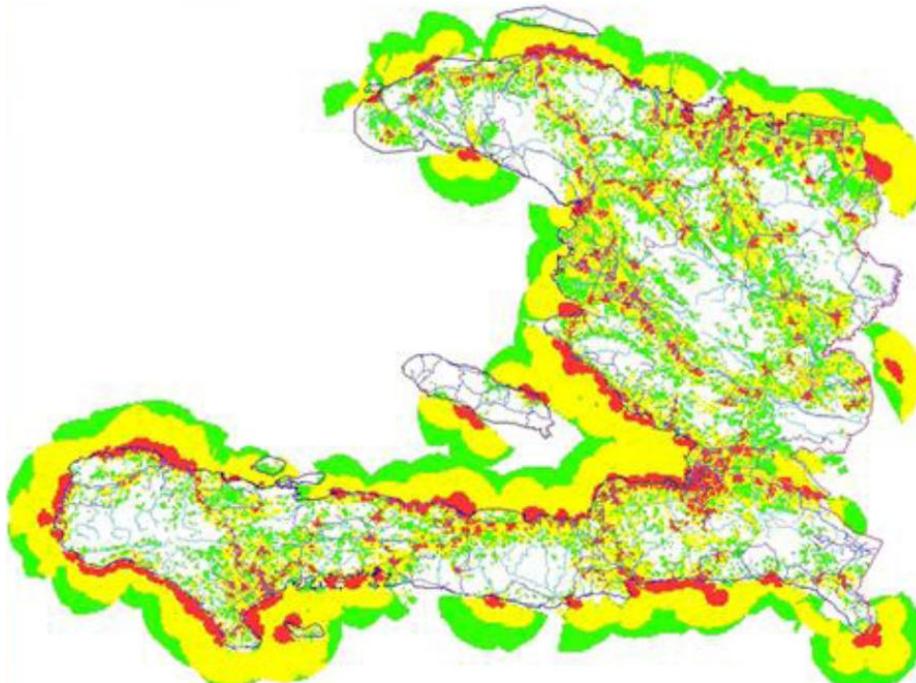
“The consistency with which Léogâne was underrepresented suggests that the focus on Port-au-Prince may have occluded the plight of individuals in this region. As rescuers were preoccupied with the situation in the capital, it took several days for aid to reach the beleaguered city” (Johnson, Grady, 2010, pg11).

The author shows “the discrepancies in reports between urban and rural areas are even more pronounced than those between cities” (Johnson, Grady, 2010, pg11).

Even if 5 million Haitians live in the countryside (50% of the population), during the crisis, almost no report was submitted from these areas.

One reason is the almost absence of network coverage (white spaces) in the rural areas (Figure 3.2.3.3) which completely excludes inhabitants from the possibility to communicate with the platform.

**Figure 3.2.3.3:** Mobile Coverage in Haiti (Johnson, Grady, 2010)



The second reason is related to what we said before; these people were isolated and most of them did not know about the existence of an Ushahidi deployment that could help them.

We argue these limitations are due to the youth of this mean.

As we described in subchapter 1.3, the crowdsourcing implies a two-way communication. So people have to know the mean to participate actively and until now, this was possible only in areas where it was easy to spread information as happened in the Haiti earthquake.

Maybe in the next future these issues will be reduced or they will disappear thanks to improvements at the platform's structure and at the better knowledge of people toward Ushahidi.

### **3.2.4 Social media may stop revolutions**

The last issue that we are going to describe it is the most controversial one and regards the use of social media during revolutions and riots.

As we showed in subchapter 2.4, the Libyan civil war was part of the Arabian Spring a series of revolts that involved different Arabian countries and where the main means used to start the revolts, according to traditional media and experts, were social media.

During these revolutions the regimes tried to stop the political mobilization, shutting down Internet and cell phone accesses but contrary to forecasts, immediately after, the most violent riots broke out. Few weeks later all the regimes fell down. Thus, the disruption of communication acted as a catalyst of the revolutionary process.

Hassanpour, Navid (2011, pg1), researcher at Yale University, states “conventional wisdom suggests that lapses in media connectivity have a negative effect on political mobilization. I argue that on the contrary, sudden interruption of mass communication accelerates revolutionary mobilization and proliferates decentralized contention.”

The author used a dynamic threshold model for participation in network collective action and the game theory<sup>45</sup> to demonstrate that “full connectivity in a social network sometimes can hinder collective action” (Hassanpour, Navid, 2011, pg8).

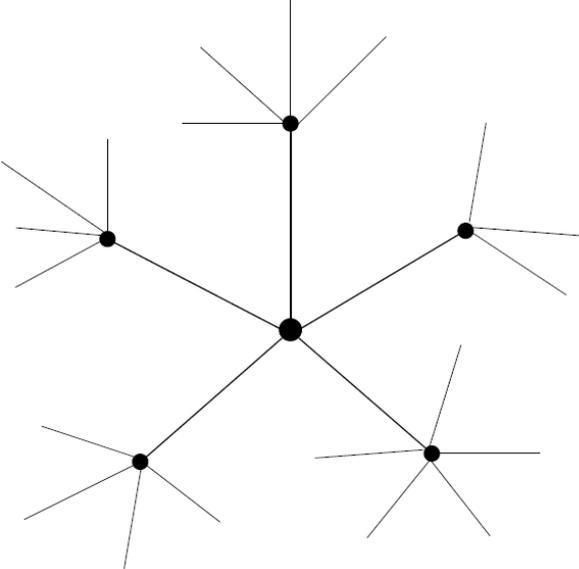
He analyzed the 2011 Egyptian uprising, particularly the period of time elapsing between the shutdown of Internet and the fall of Mubarak's regime.

The results of the dynamic threshold are depicted in Figure 3.2.4.1 and in Figure 3.2.4.2 which clearly show the issue raised by the author.

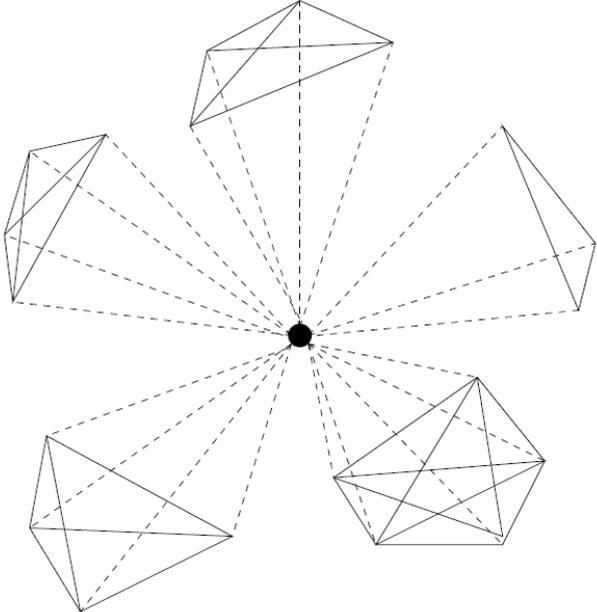
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<sup>45</sup> **Threshold model and game theory:** for more information see Granovetter, M. S. (1978) *Threshold models of collective behavior*. The American Journal of Sociology 83(6), 1420-43 and Jackson, M.O. (2008) *Social and Economic Networks*. Princeton University Press, Princeton, NJ

**Figure 3.2.4.1:** The state, centralized media and citizens (Hassanpour, Navid, 2011)



**Figure 3.2.4.2:** The state and citizens in the absence of media (Hassanpour, Navid, 2011)



In Figure 3.2.4.1, we see how the situation in Egypt was before the shutdown of Internet. The central node of the tree graph represents the state, which through the media is able to influence the citizens who are the external nodes. In this circumstance media are influenced by the state policy. Moreover, “social media nodes that serve as news propagation forums often regulate news aggregation and oversee news distribution among the online population” (Hassanpour, Navid, 2011, pg18).

The presence of social media encourages population to stay at home instead of going out and have a face-to-face communication. People, thanks to social media, have almost a complete

understanding about the situation and during the first manifestations or riots they prefer a safe place than a square. Hence, most of them are indirectly engaged and only the radical ones are actively engaged.

Then in Figure 3.2.4.2, we see the situation in Egypt after the shutdown of Internet. It is completely different; the central node (the state) has no connection because the media and citizens nodes are disappeared. Thus, the state cannot monitor and influence the communication flow; it is deprived of its propaganda tools. "In this case citizens have to rely on each other for gaining information about the political and social atmosphere" (Hassanpour, Navid, pg21).

People have to go on the street to see what it is going on.

They are encouraged to build new connections with neighbors and in this way, they augment their possibility to meet radical members who make them become actively engaged.

In the network depicted in Figure 3.2.4.2 "highly connected cells of contention start to take hold in different locations, increasing the dispersion of the protests and proliferating communal activity throughout the society" (Hassanpour, Navid, pg21).

Shehata et al. (2011) described that at the turning point of January 28<sup>th</sup>, when the government imposed the communication blackout, the apolitical strata of the Egyptian population joined the confrontation. Hence protests which were around Tahrir Square spread in different locations in Cairo.

The disruption of communications "exacerbated the unrest in three major ways: it implicated many apolitical citizens unaware of or uninterested in the unrest; it forced more face-to-face communication and finally it effectively decentralized the rebellion through new hybrid communication tactics, producing a quagmire much harder to control and repress than one massive gathering in Tahrir" (Hassanpour, Navid, pg28).

Thus, according to the author, social media and traditional media may stop the revolution because through them, the government can monitor the situation and communication between citizens.

We argue this issue is to take into account because it shows a new facet of social media that stresses the complexity of this new communication mean.

Hence, it is necessary that organizations investigate this issue in other contexts and during future crises to improve the statistical significance of the data and see if the situation described by Hassanpour, Navid (2011) is isolated or repeats itself.

### **3.3 Conclusions and managerial implications**

This research paper has shown that social media within nonprofit platform increase the speed (H1) and the efficiency (H2) in the resolution of a crisis in comparison to traditional means.

As we saw both the Ushahidi platform and social media analyzed (Twitter, Facebook) are very recent means of communication. For this reason, especially for Ushahidi, the studies are, for the most part, exploratory.

Thus, we used the previous studies, as a base, to better show the actual state of the integration between hFOSS and social media and how they work together.

We state that a new branch of research in IT management has been opened thanks to Ushahidi and other hFOSS platforms and it is necessary to develop it because the benefits for international organizations and for the entire society are evident.

This research paper with the results provided is a proof of the excellent quality of the tool that has started to revolutionize the crisis management sector.

In fact, in only 4 years, the Ushahidi platform, developed by a small high-tech start-up, it is now recognized as the benchmark for the sector and even the UN and OCHA have used it in the last crises.

We argue that this incredible success was possible thanks to a totally change of the paradigms. The pillars of Ushahidi, showed in chapter 1 and 2, are the use for the first time of social media in a standardized way, the XBC and the WOM communication instead of a hierarchical system based only on complex algorithms.

Future studies must focus on current limitations and issues that we analyzed in chapter 3 with the aim to overcome them or find alternative solutions.

It is also important, from a managerial point of view, to study in detail how the crowd and the community work together within Ushahidi and particularly the SBTF which actually is the most advanced and organized community.

We think social media have to exploit the potential coming from hFOSS, which is a totally new market. They can offer some specific tools to help hFOSS extracting and verifying data in an easier way.

Currently, social media are the new trend. Thus, every year new competitors enter a market increasingly saturated and where the competitors are fierce.

We state that a way to differentiate from others is to offer services tailored for hFOSS and international organizations. Not only the social media provider gains new costumers but it

also may increase its brand reputation promoting its engagement as a new CSR<sup>46</sup> project creating new value for the company and its stakeholders.

In this manner, users can have more trust toward the social media,<sup>47</sup> which nowadays is the biggest issue for them.

We argue that hFOSS can also help the public sector at the local level and this may be one of the future most interesting developments, primarily for the economic and managerial implications.

This adaptation of hFOSS can overcome the limitation that we described in subchapter 3.2.3: “the majority of Ushahidi’s deployments are focused on high profile cases.”

On February 4, 2010 a heavy blizzard hit Washington DC and several blogs including the Washington Post’s own blog called it “Snowmageddon” for its extreme intensity.

PICnet and Nonprofit Soapbox<sup>48</sup> built a site using Ushahidi platform with the objective “to show how Washington DC neighbors could help each other clean up after the year’s early snow storms”<sup>49</sup>.

Another deployment used to monitor a specific local issue was the mapping of Atlanta’s crime activity<sup>50</sup>. The team used the data available from the Atlanta Police Department to test if the Ushahidi platform was able to handle a huge quantity of data and then show them in a useful way. They successfully mapped the Atlanta metro area’s crimes which in 2009 were about 30.000.

These two examples show the potentialities of hFOSS within a local environment.

The main idea is that every city will have its own deployment, sponsored by the local administration or nonprofit organizations, which will help citizens and stakeholders to have a global and real-time view regarding the city where they live.

The use of hFOSS and the integration of “big data”<sup>51</sup> methodologies can be used by governments and international organizations to boost their efficiency and save economic

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<sup>46</sup> **CSR:** corporate social responsibility is a form of corporate self-regulation integrated into a business model. The goal of CSR is to embrace responsibility for the company’s actions and encourage a positive impact through its activities on the environment, consumers, employees, communities, stakeholders and all other members of the public sphere. (Wikipedia.com)

<sup>47</sup> **Trust toward social media:** for more information see Chao, Rebecca (2012) *In social media we trust?* Huffington Post, The morningside post.

<sup>48</sup> **PICnet and Nonprofit Soapbox:** is a Web development firm specializing in building open source software solutions for nonprofits, government agencies and NGOs.

<sup>49</sup> **Snowmageddon:** for more information see <http://nyc.snowmageddoncleanup.com/main>

<sup>50</sup> **Atlanta’s crime activity:** for more information see <http://crime.mapatl.com/>

<sup>51</sup> **Big data:** the huge amount of data which is collected and analyzed by companies, international organizations and public sector, on a daily basis is called big data. The term refers “to datasets whose size is beyond the ability of typical database software tools to capture, store, manage and analyze” (Manyika et al., 2011, pg1).

resources. For instance, Europe's public sector using only big data can capture a potential annual value of €250 billion, more than GDP of Greece (Manyika et al., 2011).

The possible uses are virtually infinite; thus, future studies in this field are necessary.

We think this research paper can help Ushahidi to be even more recognized as a fundamental tool in crisis management and as a mean to help citizens in everyday life.



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## **Déclaration sur l'honneur**

Je, soussigné, Matteo BELTRAMIN, certifie sur l'honneur que je n'ai rien plagié dans le travail ci-joint, ce qui signifie que je suis le seul auteur de toutes les phrases dont le texte est composé. Toute phrase ayant un autre auteur que moi a été mise entre guillemets, avec indication explicite de sa source. Je suis conscient(e) qu'en contrevenant à la présente règle je transgresse les principes académiques reconnus et m'expose aux sanctions qui seront prononcées par le conseil de discipline.

J'atteste également que ce travail n'a jamais été présenté dans le cadre d'études antérieures à ESCP Europe.

S'il s'agit d'un travail réalisé dans le cadre d'études effectuées en parallèle, je dois le préciser.

Les propos tenus dans ce mémoire n'engagent que moi-même.

Fait à Paris le 01/05/2012

## **Affidavit**

I the undersigned, Matteo BELTRAMIN, certify on the honour that I have not plagiarized the paper enclosed, which means that I am the only author of all the sentences this text is composed of. Any sentence from a different author than me was written in quotation marks, with explicit indication of its source. I am aware that by contravening to the present rule, I break the recognised academic principles and I expose myself to the sanctions the disciplinary committee will decide on.

I also confirm this work has never been submitted during studies prior to ESCP Europe.

If this work has been written during studies conducted in parallel, I must precise it.

The remarks written in those pages only commit me.

Paris, 01/05/2012