Information Verification for Humanitarians: A Critical Review

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Abstract

Quality humanitarian information is essential for efficient, effective and coordinated humanitarian responses. During crises, however, humanitarian responders rarely have access to quality information in order to provide the much needed relief in a timely fashion. Traditional methods for the acquisition and evaluation of humanitarian information typically confront challenges such as poor accessibility, limited sources, and the capacity of monitoring and documentation. The more recent emergence of user generated content from online social platforms addressed some challenges faced by traditional methods, but it also raised many concerns regarding information quality and verifiability, among others, that affect both the public and humanitarian actors. This paper provides an overview of information verification methods in literature and reviews information collection and verification practices and tools used by news agencies and humanitarian organizations. Twenty crowd-sourced information projects in humanitarian and human rights nature are surveyed. We discuss the findings and give recommendations for future research.

Keywords: information verification, user generated content, source evaluation, cross-validation

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1 Introduction

Since the 1950s, the number and magnitude of disasters have increased exponentially (Özdamar and Ertem, 2015). About 300 million people on the average are effected annually since the 1990s (ibid.). Faced with complex humanitarian situations, responders rarely have access to quality information for decision-making to provide much the needed relief in a timely fashion. Besides the local knowledge, examples of such information include the aid requests of victims, the numbers and locations of
internally displaced persons, the incidents reports, the conditions of essential local infrastructures, just to name a few. Humanitarian information is valued as the *sine qua non* of humanitarian response (OCHA, 2006), and humanitarian information management and exchange are the principle source of situational awareness, crisis decision-making and coordination (Altay and Labonte, 2014).

Traditional methods for the acquisition and evaluation of humanitarian information typically confront a number of challenges. First, to deliver aid and assistance, humanitarian actors need to assess the situation and/or to seek representatives of the affected populations for interviews, but the actors are not always present in the vicinity of conflict or disaster zones, or have access to those areas. Second, due to limited resources, accessibility, security and time, it is often very hard if not impossible to find victims and witnesses who can and are willing to provide potentially sensitive information. Third, humanitarian actors rarely have the capacity to continually monitor and document the incidents over time in the affected areas, and to provide the affected populations timely and effective aid in return.

In recent humanitarian crises such as the 2010 Haiti earthquake and the 2011 Egyptian revolution, incorporating humanitarian information from social media and User Generated Content (UGC) proved useful when the information was inspected at an aggregated level (Dugdale et al., 2012). During those crises, online platforms such as Twitter and Facebook facilitated reporting information more efficiently than traditional communication channels (Norheim-Hagtun and Meier, 2010; Hermida et al., 2014), and addressed some challenges faced by the traditional methods. The information contained in UGC can be vital for effective response (Takahashi et al., 2015), and can be used to boost the speed and accuracy of relief operations in real-time, and to empower and uplift the morale of the local populations (Carley et al., 2016; Conrad et al., 2016; Panagiotopoulos et al., 2016; Haworth, 2016). Nevertheless, existing humanitarian information systems using technologies such as social media and crowd-sourcing have shortcomings including but are not limited to the following (Tapia et al., 2011; Dugdale et al., 2012; Haworth, 2016; Conrad et al., 2016; Anson et al., 2017):

1. The systems are not effective in collecting relevant and quality information. While there is information overload and processing difficulties, there is also a high risk of receiving inaccurate and incorrect information (including that from malicious users).
2. There is no or limited evaluation of the reliability of the sources and the credibility of the information, making humanitarian actors and affected communities vulnerable to inaccurate and incorrect information.
3. The contributed information has largely been deemed as unverifiable and untrustworthy. Thus it is construed as unsuitable to incorporate into established mechanisms for decision-making.
4. There is a lack of feedback loops and empowerment of those (often the affected populations) who contributed the information, partly due to the above shortcomings.

The quality of information from UGC is a major challenge that affects both the public and humanitarian actors (Haworth, 2016). The vast volume of UGC circulating in social media contains relevant and useful information, which is potentially life-saving, but it also contains floods of irrelevancy, inaccuracy and rumours (Anson et al., 2017). For these reasons, although there have been needs and interests from the humanitarian actors and local communities in the field to establish (effective and reliable) information exchange, many humanitarian actors are sceptical about the levels of reliability of self-reported information since the information is often unverifiable (Altay and Labonte, 2014; Conrad et al., 2016).

How to detect relevant humanitarian information and verify the information in an effective and efficient manner is the concern of this paper. In the following, we first provide an overview of information verification methods in literature, then review information collection and verification practices and tools used by news organizations and humanitarian organizations. We end with a discussion of the findings and recommendations for future research.
In literature, some researchers make no distinction between data (quality) and information (quality) (e.g., Wand and Wang, 1996; Pipino et al., 2002; Loshin, 2011) while some others see the difference as being crucial (e.g., Ackoff, 1989; Lillrank, 2003; Price and Shanks, 2005). The definitions of data or information quality in literature are also equivocal. In this paper, information quality refers to the semantic and pragmatic clarity of UGC rather than its syntactic clarity (Huang, 2013). Important dimensions of information quality include relevance, accuracy, volume, completeness, timeliness, reliability and verifiability (Shanteau, 1992; Yildiz, 2015; Shamala et al., 2017). In relation to those, veracity can be defined as the combination of how accurate, complete, reliable and timely the information in question is (Lin et al., 2016). Veracity can also include trustworthiness which is an aggregated dimension determined by the data origins (or the sources), and the data collection and processing methods (ibid.).

Information detection and verification are often researched in the context of investigative journalism and (business, police, civilian or military) intelligence, and in more general applications. Four major types of (not necessarily mutually exclusive) (text-based) information detection and verification methods can be identified in literature: 1) cross-validation, 2) expert opinion, 3) crowd-sourcing, and 4) machine learning; see Table 1.

**Cross-validation** a.k.a. triangulation, of independent data sources is the process where humanitarian actors utilize additional information to validate the veracity of given information extracted from UGC (Crowley et al., 2013). A major limitation is the required manual input of users for validation. Its effectiveness is directly and entirely dependent on the skill and ability of the users (Daume et al., 2014).

**Expert opinion** is the process where experts or people of authority utilize their expertise or authoritative sources to validate the veracity of information (Martin, 2016). This type of methods is limited by the availability of experts in the field (ibid.). Similar to cross-validation, it often requires extensive manual input, and the knowledge, skill and network of the users (ibid.).

**Crowd-sourcing** is the use of Internet platforms in combination with the input of social media in order to validate the veracity of information harnessed from UGC (Riccardi, 2016). The users verify whether the given information is of good quality. This requires a large number of users to determine the veracity of the information (a.k.a the wisdom of the masses, or collective intelligence) (Howe, 2008; Basu et al., 2016).

**Machine learning** is the technology of getting computer systems to act without being explicitly programmed (Michalski et al., 2013), achieved through automated statistical methods (Alpaydin, 2014). Machine learning is applied in many fields such as voice and image recognition, financial predictions, information verification and many other fields. Decision makers in the humanitarian domain are still hesitant to use such methods due to the uncertain accuracy and poor understandability (Altay and Labonte, 2014; Conrado et al., 2016).

In addition, all the above methods do not explicitly and effectively detect malicious uses and rumours along the detection and verification of relevant information. Malicious uses and rumours are sources of instability during relief operations (Conrado et al., 2016; Riccardi, 2016). They can disrupt the flow of humanitarian operations (Haworth, 2016). For example, terrorists and kidnappers, and sometimes even the affected communities, media and humanitarian actors might publish false or unverified information (Altay and Labonte, 2014; Riccardi, 2016). The abuse and misuse of information can create additional conflict and problems, and possibly put people in danger and jeopardize the success of the relief operation (Riccardi, 2016).

### 3 Information Verification in News Organizations

Some news agencies (particularly investigative journalists) and humanitarian actors lately started using information verification tools for UGC due to the emergence of new media (Brandzaeg et al., 2016; Altay and Labonte, 2014):
Table 1: Four major types of information detection and verification methods (Vaporidis, 2019)

| Method          | Limitation                                                                                     | Reference                      |
|-----------------|-----------------------------------------------------------------------------------------------|--------------------------------|
| Cross-validation| • Restricted by the required user input  
• Directly and entirely dependent on users’ skill and ability  
• No or poor detection of malicious users and rumours                                  | Crowley et al. (2013)  
Daume et al. (2014) |
| Expert Opinion  | • Limited availability of experts  
• Restricted by the required user input  
• Dependent on users’ knowledge, skill and network  
• No or poor detection of malicious users and rumours                                    | Martin (2016)                  |
| Crowd-sourcing  | • Requires a great number of users  
• Restricted by the required user input  
• No or poor detection of malicious users and rumours                                     | Basu et al. (2016)  
Callaghan (2016)  
Gao et al. (2011)  
Ludwig et al. (2017)  
Meier (2011)  
Riccardi (2016)  
Soden and Palen (2014)  
Yuan and Liu (2018) |
| Machine Learning| • Needs good training data  
• Uncertain accuracy rates  
• Hard to obtain trust from users because of its untransparent inner working  
• No or poor detection of malicious users and rumours                                      | Ali et al. (2017)  
Carley et al. (2016)  
Castillo et al. (2013)  
Diakopoulos et al. (2012)  
Hung et al. (2016)  
Kang et al. (2012)  
Liu et al. (2016)  
Özdamar and Ertem (2015)  
Spence et al. (2016) |

- News organizations traditionally focuses on “breaking news”. Some now focus more on being the best at verifying and curating the information (Newman, 2009).
- Established humanitarian actors traditionally operate with centralized command structures, standard operating procedures, and internal vetting standards to ensure the flow, accuracy and verification of information. With the current expectation of speed and efficiency, there are transitions toward harvesting UGC in combination with verification (Coyle and Meier, 2009; Tapia et al., 2011; Walton et al., 2011).

In the following, we review the verification practices and tools reported in literature. “Practices” refers to the information verification processes, methods and techniques through which the content is verified. “Tools” are for instance the computerized or manual checklists, and software platforms.
that facilitate the verification.

Established news agencies have their own verification practices, or outsource the verification of sources to other companies (Hermida et al., 2014; Schifferes et al., 2014). There are three common practices (Bruno, 2011):

1. The centralized approach, that tries to verify information within one's own organization.
2. The decentralized approach, that tries to incorporate the crowd in verification through live blogging or streaming.
3. The community-based approach, which tries to create a platform for verification through crowd-sourcing.

For example, the BBC created its centralized UGC Hub in 2005, The Guardian has its decentralized verification platform, and the CNN has its community-based iReport launched in 2006 (ibid.). At the UGC Hub of BBC, potentially valuable photos, texts and emails are verified before they are published. This is done centrally at the BBC news room, by calling the contributor personally, when possible, and asking basic questions regarding the authenticity of the content (Harrison, 2010). The content is subsequently verified by cross-validation (Popoola et al., 2013). For photographs, the precise place and time of the photos are important factors for verification. They are compared and verified with the statement of the source (Bruno, 2011). The UGC Hub uses four metrics to verify the credibility of Twitter accounts (Popoola et al., 2013): (1) the number of Twitter followers an account has; (2) is the account followed by an reputable source? (3) previous posts by the account; and (4) how long the account has been active for? For emails the IP addresses are checked, and for phone calls, the number prefix. Nonetheless, reaching out to the sources in person remains the most important verification method at the BBC UGC Hub (Bruno, 2011). At CNN, a different approach is used focusing on the online community of contributors. The information posted on iReport is not checked prior to publication, but can be verified by other users afterwards. Readers can recognize verified stories by badges given when the stories are verified by other users (ibid.).

Another example of community-based approach is the U-Shahid project. It is launched by an Egyptian group based in Cairo worked with a journalist from Thomson Reuters. The project developed a checklist during the 2011 Egyptian crisis, with four principles for the verification of sources (Meier, 2015): (1) unknown sources are called back when possible. The source is asked if he or she was an eyewitness, or if more information can be provided; (2) a trusted source in the area is contacted for verification when possible, and trusted NGO workers are contacted; (3) online research is performed, to look for similar videos, photographs and blog posts; and (4) cross-validation of information with reports received.

During the Arab spring, Andy Carvin, a journalist of National Public Radio (NPR), asked his Twitter followers to verify reports (Hermida et al., 2014; Meier, 2015). He received news, and verified it by retweeting it and asked for eyewitnesses and sources. They helped him translate, cross-validate and track down the key information (Silverman, 2014). Unreliable sources were dropped and reliable accounts were saved (Hermida et al., 2014).

News agencies such as Al Jazeera, The New York Times and The Wall Street Journal have outsourced the verification of photo and video content to Storyful, a company founded in 2010 and bought over by News Corp for $25 million in 2013 (Hermida, 2015). Storyful verifies Twitter sources by looking at: (1) the time of day of posts; (2) the weather in the content versus the actual weather reports; (3) the accents spoken in video content; and (4) the landmarks which can be confirmed by other sources (Popoola et al., 2013).

There are a few other tools developed for information verification used by journalists. For example, Tweetdeck is a tool for checking, and screening Twitter posts, also used by media organizations (Sump-Crethar, 2012). The Reuters created its own computerized tool for verifying real-time news events on Twitter. All its event processing is computerized, and machine learning is used to verify fake news Tweets (Liu et al., 2016). Besides those, tools such as TinEye and Google reverse image search are also used for the verification of photos (Pantti and Siren, 2015). The EU Social Sensor project aims at creating groups of reliable Twitter users to verify posts and accounts, and designing a new tool to search across social media for news stories, surface trends, and help with verification (Schifferes et al., 2014).
4 Information Verification in Humanitarian Organizations

The basis of information verification by humanitarian organizations lies in the principles of Humanitarian Information Management and Exchange endorsed by OCHA (United Nations Office for the Coordination of Humanitarian Affairs) and many other humanitarian actors (Van de Walle et al., 2008). One of the principles – verifiability – stresses the ability to ensure that information represents what it supposed to represent and the methodologies to validate information are sound; another principle – reliability – stresses the credibility of the source and the method of collection.

The verification of information from UGC in humanitarian situations can take an intrinsic and/or extrinsic approach (Conrado et al., 2016). With an intrinsic approach, the validity of the content, context and the contributor themselves (i.e. the intrinsic properties) are researched. With an extrinsic approach, additional resources to validate the information (i.e. the extrinsic properties) are searched, e.g., experts, crowd-sourcing and linked data (ibid.).

The idea behind crowd-sourcing is that although “truth” is uncertain, with enough volume, a “truth” emerges that diminishes false reports (Okolloh, 2009). Four elements can be checked to confirm crowd-sourced information in humanitarian context: 1) Provenance: confirm the authenticity of the piece of information. Is this the original piece of content? 2) Source: confirm the source. Who uploaded the content? 3) Date: confirm the date of the event and the time of the content. When was the content created? 4) Location: confirm the geolocation. Where was the content created? (Wardle, 2014).

In the aftermath of the 2010 Haiti earthquake, UGC contributed to humanitarian responses. It is led by the Ushahidi platform and street mapping platforms such as the Humanitarian OpenStreetMap Team (HOT) (Soden and Palen, 2014). These platforms were used because traditional information gathering in humanitarian organizations were not designed to integrate intelligence from local communities, and individual communications of the Haitians were lost (Heinzelman and Waters, 2010). A challenge during the Haiti earthquake response was to make a reliable crisis map of the affected area for humanitarian actors to focus their relief efforts on (Meier, 2011). Ushahidi-Haiti provided crisis mapping created by a team of volunteers based on reports received via Twitter, email, SMS and other sources (Norheim-Hagtun and Meier, 2010). Information verification at the Ushahidi platform can be performed in two ways. On the site of Ushahidi, there is a verification button that allows the crowd to verify the content of the crises map (Gao et al., 2011). But generally only a few people served as verifiers across Ushahidi map cases (ibid.). The second way is to manually check the reports by Ushahidi staffs. The approval process was rather ad hoc1 which is a risk with any crowd-sourcing tool (Okolloh, 2009).

Verily is a platform designed for rapid collection and assessment of information generated during natural disasters (Popoola et al., 2013). The departure point is the posting of a verification request, structured as a yes/no event-based question, e.g., “Is the Brooklyn bridge damaged in the storm?” The request shall trigger the collection of evidence to assess, through evaluation of collected evidence, whether a given event has actually happened. There are also initiatives that aim to create networks of volunteers worldwide to help verify humanitarian information during crises, and to create Crisis Maps, e.g. CrisisCommons, CrisisMappers, Standby Task Force, Humanity Road (Ziemke, 2012; Rogstadius et al., 2013; Cobb et al., 2014; Norris, 2017).

Table 2 provides a list of projects that use crowd-sourcing to acquire information in humanitarian and human rights nature2. Our research shows that many crowd-sourcing projects do not inform their sources of the risks entailed with reporting potentially sensitive information using media that can be traced or channels that can be intercepted. Rarely precautions are taken to secure collected data, in

1“Where possible, we called or emailed reporters to try to verify reports. Where people reported anonymously, stories were counter-checked by comparing with other sources e.g. mainstream media. Where information appeared credible but we could not verify it, we posted it and noted that it was not verified” (Okolloh, 2009).
2We used largely publicly available information e.g. organizations’ websites and publications, traditional and social media articles such as newspapers and blogs, as well as academic literature. Interviews were conducted per phone or internet video call with: OCHA / Libya Crisis Map, Harassmap Egypt, Front for the Defence of Egyptian Protester, Resolve / LRA Crisis Tracker, Safecity India, Agresiones contra periodistas y blogueros en Mexico, and Women’s refugee commission / Watchlist on Children.
particular sensitive information such as biographic information. In fact, many projects seem to be either unaware of these challenges or when aware they appear ill-equipped to tackle them.

From a technological point of view, Ushahidi stands out as the most used crowd-sourcing platform in the humanitarian domain. The platform is often deployed without or with minimal customization unless run by professionals. The project teams often lack the necessary resources to use the platform to its full capacity or integrate it with other technologies such as SMS gateways and aggregators or Interactive Voice Response systems. The teams usually settle with the out of the box functionalities without considering which ones need to be deployed to address the needs of the users. For example, for some NGOs, Internet communication security policies prevented access to Ushahidi’s website during the Haiti crisis response (Altay and Labonte, 2014). In many cases, the dynamic event data aggregated could not be fully integrated into coordination mechanisms because it did not align with the specific information requirements of the organisations including large NGOs and the UN (Nelson et al., 2010; Morrow et al., 2011; Altay and Labonte, 2014).

A few projects stand out for their professional and innovative approaches. The LRA CrisisTracker project is taking security very seriously and developed a complete codebook to ensure high data quality. It is the only project uncovered insofar that has a methodology in place to assess the veracity of the information gathered. Facing the same challenges as with many other projects, it does fall short in terms of sourcing and does not record enough information to allow for an unbroken chain of custody. Digital Democracy’s Empowering Women in Haiti has developed robust feedback loops allowing victims of sexual or gender based violence to seek assistance. The Front to Defend Egyptian Protesters uses a variety of tactics, including crowd-sourcing of information when appropriate. From all the projects reviewed it is the only one that proactively works with lawyers who systematically and personally verify reported information and follow case files of detained protesters.

In terms of innovation, some developments took place in the sphere of semantic analysis and machine learning with projects such as Syria CrisisTracker, which tried to make sense of publicly available information from the media with the help of algorithms that seek to automatically assess the relevance of published information, clustering these along known topical issues. Other projects which were still on the test bed also showed interesting promises, such as the Standby Task Force aimed to micro-task the analysis of a large piece of satellite imagery in Somalia to help the UN assess the number of displaced persons in a given area. Although these attempts showed shortcomings and needed to be further professionalized, the ideas and concepts that drive them show a promising future if properly used.

5 Discussion and Future Research

Information verification is traditionally important and challenging. It becomes even more so with the emergence of new technologies such as social media and crowd-sourcing. Due to different traditions, the news and humanitarian organizations have different practices and use different means for information gathering and verification. Both domains could learn from each other’s experiences. Although with varied focuses, both tend to expand information verification from a centralized internal approach towards a more community-based external approach, where the content, context and sources are checked by means of e.g. crowd-sourcing and micro-tasking instead of only by the organizations themselves. This trend is not without consequences, however. Engaged citizens and volunteers who use crowd-sourcing to report incidents and document events, as well as the organizations that deploy crowd-sourcing platforms may come unprepared and inexperienced to the tasks. The potential privacy, safety and security risks and challenges can be overlooked both by the contributors and the organizations. Even when there is awareness, those issues are often challenging to tackle given the time and resources available.

Beyond warranted privacy, safety and security concerns, the information gathered is often incomplete and is of limited use beyond advocacy. In general, information verification is lacking. The basic 5W1H questions (when, where, who did what, why and how) are rarely answered. Many projects developed their own taxonomies that are not well defined, leaving their sources or those manually processing the information guessing what each category refers to. As categories do not align with known
Table 2: Crowd-sourcing projects in humanitarian and human rights nature

| Platform and Description | Technology Used |
|--------------------------|-----------------|
| **AFRICA**               |                 |
| **Libya Crisis Map (Libya)** | Ushahidi, Skype incl. instant messenger, Google Docs, Google Groups |
| Early March 2011, OCHA activated the Standby Volunteer Task Force (SBTF), a group of volunteers with various field of expertise, to create the Libya Crisis Map to help provide better situational awareness about the situation unfolding on the ground. The UN had no access to the country and OCHA did not have the resources to gather, verify and process the amount of online available information. The website was made available to organizations responding to the Libya crisis with the intention to provide them information that may assist in improving their operational planning. In April 2011 the SBTF handed over the map to OCHA which maintained it with a group of volunteers until 4 June 2011. |                 |
| **The Front to Defend Egypt Protesters (FDEP) (Egypt)** | Telephone hotlines, SMS, Twitter, Flickr, Youtube, Blogs, Google maps, Google Drive, RSS feeds |
| Early April 2010, some 34 NGOs in Egypt setup the FDEP to provide legal and informative support to participants to peaceful demonstrations; provide coordinated response to random and mass arrest by the police as well as detention and inhumane treatment of protesters and detainees; and help coordinate efforts and work by human rights groups and lawyers towards their release. By 2011 FDEP’s mandate expanded to cover a total of 8 governorates and provide legal support to those tried by military courts. To reach this objective, the FDEP set up several hotlines used by activists to report via SMS or calls about arrest, detentions, injuries and the need for lawyers. Protesters facing arrest were given the possibility to SMS their full name, age, ID, health status, time and location of detention. Upon reception of such information FDEP lawyers would go to police stations and other possible places of detentions close to the area of the demonstration to insure that those arrested do not face torture or violence and assist the interrogation process. Lawyers also update a FDEP communication team with the status of the prisoners allowing a medical team to try to gain access in case protesters are injured and a provision committee to provide food, drinks, medication and other necessity. After verification of the information the communication team would post the name of the detainees and their location of detention on the FDEP blog allowing families and relatives to call and provide additional information. The communication team also post media reports in Flickr and Youtube platforms and initiated a Twitter hashtag (#EgyDefense) to tweet immediate news. |                 |
| **Harass map (Egypt and several countries in the world)** | Ushahidi, FrontlineSMS, Twitter, Facebook, email |
| Harassmap was launched in December 2010 by four volunteers using Ushahidi and FrontlineSMS “with the mission to end the social acceptability of sexual harassment and assault in Egypt”. By means of online and mobile technology, mass media and communications campaigns Harassmap support an on-the-ground mobilization efforts by 780 volunteers spread across 15 governorates in Egypt focused on changing perceptions so that people start seeing sexual harassment and assault as the crime it actually is and start standing up to it before and when they see it happen. The end goal is to restore a sense of social responsibility and make all of Egypt a “Safe Zone”. |                 |
| **Speak-to-Tweet (Egypt, Syria)** | Twitter, Telephones, Google docs |
| A joint project by Google and Twitter that in case of Internet blackouts like the one experienced in Egypt begin 2011 and more recently in Syria end 2012 allows users to get their voices heard by calling designated phone numbers and leave a voice message which is automatically tweeted with the hashtag of the country of origin of the call, without the need for an Internet connection. |                 |
| **UN (Somalia and Syria)** | Tommod, Ushahidi |
| The United Nations reportedly approached the Standby Task Force (SBTF) to pilot the crowd-sourcing of the satellite imagery analysis of a stretch of Somalian territory to tag the possible location of shelters. No operational purposes. Test only. |                 |
### Table 2: Crowd-sourcing projects in humanitarian and human rights nature

| Platform and Description | Technology Used |
|--------------------------|-----------------|
| **AFRICA**               |                 |
| **Voix des Kivus (Democratic Republic of the Congo)** | FrontlineSMS, R, LaTeX |
| The objective of this Columbia University project was to examine the potential for using SMS technology to gather conflict event data in real-time using a “crowd-seeding” approach instead of a crowd-sourcing approach. Using standard principles of survey research and statistical analysis, 18 sites in the province of South Kivu were sampled. In each site 3 trusted reporters were identified, trained and provided with a mobile phone and reporting instructions. Only they could contribute reports, rather than the crowd with a mobile phone or connection of some sort, as it the case with standard crowd-sourcing platforms. |
| **LRA Crisis Tracker (CAR, DRC, South Sudan)** | HF Radios, satellite phones, cloud based Salesforce platform |
| Gather information about the Lord’s Resistance Army movements and attacks from a local early-warning radio network supported by Invisible Children in addition to data sourced from the United Nations, local Non-Government Organizations, and first-hand research to improve efforts to combat LRA atrocities and help communities in need. To achieve these objectives, Invisible Children deployed HF radios in several location across northern D.R. Congo and larger towns in eastern Central African Republic (CAR) as well as satellite phones to local security committees in more remote and less restive locations in eastern CAR. In Southern Sudan, existing HF radios are informally “plugged in” into Invisible Children’s radio network. Local security committees gather information about LRA activities and related security incidents from a variety of local sources, both direct and indirect, and transmit them via the HF network or satellite phones to Invisible Children team based in Dungu, D.R. Congo. The Invisible Children staff in Dungu also participate in weekly OCHA led protection cluster as well as the MONUSCO led Joint Information Operation Cell (JIOC) meetings with other humanitarian actors active in the area who may share information about LRA activities. The collected information is putted into a customized version of the Salesforce customer relationship platform which is ultimately analysed by Resolve analysts who produce regular security briefs. Simultaneously, information about LRA activities for which there is a reasonable doubt that they occurred are published via an interactive map on the LRA Crisis Tracker website. |
| **Hatari (Kenya)** | Ushahidi, Frontline SMS, Twitter, Email |
| Allow Nairobi residents to report incidents of crime and corruption in their own voices by SMS, Twitter, smartphone app, email or via the website. |

| **MIDDLE-EAST** |                 |
| **Syria Tracker (Syria)** | Ushahidi, HealthMap platform, Crisis Tracker platform, Twitter, Facebook, Speak-to-Tweet |
| A crowdsourcing effort that has been collecting citizen reports on human rights violations and casualties in Syria, since April 2011 which goals are to provide the number of the fatalities and preserve the name, location and details of each victim. Whenever possible, each name is linked to a photo or video of each casualty. Syria Tracker provides: A continually updated list of eye witness reports from within Syria, often accompanied by media links; aggregate reports including analysis and visualizations of deaths and atrocities in Syria and a stream of content-filtered media from news, social media (Twitter and Facebook) and official sources. |
| **Women under siege (Syria)** | Ushahidi, email, Twitter, app |
| Document and map reports of sexual violence in the context of the Syrian conflict discover whether rape and sexual assault are widespread—such evidence can be used to aid the international community in grasping the urgency of what is happening in Syria, and can provide the base for potential future prosecutions. |
| **Middle East Domestic Help Abuse Reporting (Middle-East)** | Ushahidi, crowdmap, email, Twitter, SMS |
| Allow human rights organizations, concerned citizens and migrant workers victims of domestic abuse to report alleged incident of abuses to palliate to the lack of a centralised source for data about abuses against migrant workers. |
### Table 2: Crowd-sourcing projects in humanitarian and human rights nature

| Platform and Description | Technology Used |
|--------------------------|-----------------|
| **AMERICA**              |                 |
| Hollaback (USA and several countries in the world) | Hollaback app, Google maps |
| Expose street harassers by documenting, mapping and sharing incidents of street harassment by means of a smartphone application. | Hollaback app, Google maps |
| Digital Democracy – Empowering women in Haiti (Haiti) | Noula (an Ushahidi like platform) |
| Assist gender-based violence victims and empower women in general in Haiti by means of technology and grass-root activities. | Nourla (an Ushahidi like platform) |
| #PorTodosLosDesaparecidos (Central America) | Crowdmap, Smartphone app, Emails |
| To record the 27 thousand missing that the National Human Rights Commission (NHRC) has registered in view of facilitating a direct contact between the victims, citizens, family and the media. | Crowdmap, Smartphone app, Emails |
| #PorTodosLosDesaparecidos (Central America) | Crowdmap, Smartphone app, Emails |
| To record the 27 thousand missing that the National Human Rights Commission (NHRC) has registered in view of facilitating a direct contact between the victims, citizens, family and the media. | Crowdmap, Smartphone app, Emails |
| Agresiones contra periodistas y bloguarios en MÃ¡xico (Mexico) | Crowdmap, Smartphone app, Twitter, Emails, telephone |
| Joint programme of Freedom House, the International Centre for journalists and Mi Mexico to record and map incidents of attacks against journalists, bloggers and citizen reporters in Mexico. | Crowdmap, Smartphone app, Twitter, Emails, telephone |
| Retio (Mexico) | Retio, Twitter |
| Crowdsourced citizen reports via Twitter about any danger or problems in their areas, including activities of security forces. These reports are recorded in a database and published online to allow users to better understand their environment and let the authorities know that their actions are being monitored with the hope that it will inhibit extortion, arbitrary detention, abuse of authority and police brutality | Retio, Twitter |
| **ASIA**                 |                 |
| Women Empowerment for Social Change Program (Cambodia) | Ushahidi |
| Map reported incidents of gender based violence in Cambodia to offers both government officials, key stakeholders and the public the opportunity to track incidences of gender based violence online to increase awareness and work toward immediate intervention and prevention methods. | Ushahidi |
| Safecity India (India)   | Ushahidi, Twitter, Email, smart phone app, Interactive Voice Response system |
| Safecity is an information aggregation platform for victims and witnesses of sexual harassment to report harassment of a sexual nature and help identifying locations where these occurred. The final objective of Safecity is not so much recording information to seek redress for the victims sexual harassment, but is mainly preventive by highlighting a serious social issue to change the way our society thinks and reacts about sexual harassment, which in time will hopefully lead to a safe and non-violent environment for all. | Ushahidi, Twitter, Email, smart phone app, Interactive Voice Response system |
| **EUROPE**               |                 |
| Rate your Rights Serbia (Serbia) | Internet based questionnaire |
| An UNDP/UNHCHR initiative in partnership with the Belgrade Centre for Human Rights and media outlet b92 to crowdsource answers to a questionnaire on the state of human rights in Serbia in the context of the Universal Periodic review and at a later stage to comment on the answers given by the State of Serbia to the same questionnaire. | Internet based questionnaire |
| Istanbul Violence (Turkey) | Ushahidi crowd-map, Twitter, emails, app |
| Map violence during the June 2013 demonstrations that erupted in Taksim square and spread to other towns across Turkey. | Ushahidi crowd-map, Twitter, emails, app |

International Humanitarian Law and human rights categories, the data gathered could not be easily used or compared unless being recoded. The quality of the verification procedures, if any, varied largely. Some projects did not attempt to verify the information gathered and published, other applied simplistic methods. For example if the information has been reported by a traditional media it was deemed verified. Some tried to cross-validate the information gathered but did not document or publish their methodologies. Combined with the frequent lack of information verification, the lack of source evaluation rendered many projects permeable to disinformation attempts which beyond affecting the credibility of the projects could also have real-life effects.
In terms of scalability and empowerment, many projects which are not run by professionals or supported by established organizations do not adopt a human centered design process when designing and deploying crowd-sourcing technologies; consider desired impact and outcomes, inputs and outputs. Some projects have a pre-determined idea of what could or should be done and hope that by deploying a crowd-sourcing platform people will start reporting information relevant to the project goal. Communication cultures (e.g. prominent use of text or voice) or the level of literacy of the targeted users is rarely taken into consideration. Sensitization efforts around the project are often minimal, relying too often on existing social media channels that are only accessible to a (computer) literate audience. At times, the sole objective is the collection and publication of information, without further use expected. The flow of information remains unidirectional, with no feedback loops that could stimulate the empowerment of the sources and users of the information. The success of such endeavours remain limited, with the crowd-sourcing nature of several projects relying on a few devoted volunteers.

To tackle these challenges, we propose the following research agenda for future work. First, the state of the art in the domain of (business, police, civilian and military) intelligence shall be surveyed. There is a rich body of knowledge related to information collection and verification in this domain. Limited by time and resources, this project only surveyed and reported on the state of the art in investigative journalism and humanitarian information systems. Interesting research questions include: Can the methodologies and technologies for information collection and verification from investigative journalism and (business, police, civilian and military) intelligence add value to the humanitarian domain? To what extent can those methodologies and technologies be reused and adapted to improve the quality of humanitarian information and meet the needs of crisis decision-making and coordination?

Second, with respect to information quality for humanitarian responses, clear operational guidelines shall be defined for the desired information quality dimensions, and how to assist achieving the information quality goals during the preparation and information collection stages as well as later stages, regardless whether the information is being crowd-sourced or not. Although there exists a set of humanitarian information management principles\(^3\), defining concrete operational guidelines that can be integrated or tailored to the existing practices of major humanitarian actors, is essential to help achieve those goals. Interesting research questions include: How to operationalise the humanitarian information management principles? How to refine or translate those principles into measurable information quality dimensions and metrics so that humanitarian actors have well-defined and implementable standards and guidelines to improve information quality during the preparation, information collection and verification stages?

Third, in the humanitarian domain, resource intensiveness in terms of manpower and time, combined with the complexity of the tasks, are serious impediments to collecting good quality information and to information verification. There have been a number of initiatives and projects that aim to use technology to facilitate those tasks, but the processes and platforms that could effectively and efficiently address the complexity of those tasks are not yet mature. There is an urgent need for technological innovation and breakthrough in the humanitarian domain, but the difficulties and challenges reside not in the technological side or the socio-political side alone but in the combination and dynamics of both. Simply put, the best piece of technology will not be practically useful, especially in crisis situations, if there is a lack of sufficient consideration for privacy, safety and security by design, or if other socio-political context and important values are not taken into careful consideration. With respect to the socio-technical nature of humanitarian information systems, interesting research questions include: How to facilitate humanitarian actors to detect and collect relevant information and verify the information using emerging technologies such as smart analytics, machines learning, crowd-sourcing and micro tasking? How can such technologies be designed to empower the humanitarian actors and the affected communities alike in a scalable and sustainable manner?

To summarize, using emerging technologies such as crowd-sourcing and machine learning for information collection and verification is still in its infancy and shows many limitations. There are

\(^3\)Theses are: Accessibility, Inclusiveness, Inter-operability, Accountability, Verifiability, Relevance, Impartiality, Humanity, Timeliness, Sustainability, Reliability, Reciprocity and Confidentiality (Van de Walle et al., 2008).
many challenges ahead calling for research and innovation. Many projects surveyed by this work lacked methodologies and relied heavily on human input for documentation and analysis. Recorded information lacked quality, and taxonomies differed between projects. Methodological standards appeared non-existent. Source evaluation as well as cross-validation was a seldom phenomenon and could be improved when present. Privacy, safety and security safeguards were rare. Save when projects were accompanied by grass-root activities, feedback loops to affected communities or information contributors had seldom been put in place, restricting empowerment opportunities. Often communication channels required users to have access to the Internet, which limited the user base to a more educated and resourceful crowd, and inhibited the participation and empowerment of less educated and disadvantaged crowds. Unless when the project are run by professionals, project initiators developed few synergies and partnerships with likewise projects and other concerned actors. More coordination, collaboration and knowledge sharing is needed in future projects.

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