WhatsApp for Monitoring and Response during Critical Events: Aggie in the Ghana 2016 Election

Andrés Moreno
United Nations University Institute for Computing and Society
amoreno@unu.edu

Philip Garrison
United Nations University Institute for Computing and Society
philipgarrison@unu.edu

Karthik Bhat
United Nations University Institute for Computing and Society
ksbhat@unu.edu

ABSTRACT

Mobile Instant Messaging platforms like WhatsApp are becoming increasingly popular. They have expanded access to digital text, audio, picture, and video messaging. Integrating them into existing crisis monitoring and response platforms and workflows can help reach a wider population. This paper describes a first attempt to integrate WhatsApp into Aggie, a social media aggregating and monitoring platform. We report on the deployment of this integration during Ghana's 2016 election, along with Twitter, Facebook, and RSS. The WhatsApp messages collected by Aggie during the election improved the effectiveness of the monitoring efforts. Thanks to these messages, more incidents were found and escalated to the Electoral Commission and security forces. From interviews with people involved in monitoring and response, we found that the WhatsApp integration helped their coordination and monitoring activities.

Keywords

social media analysis, election monitoring, crisis prevention, WhatsApp, Ghana, mobile instant messaging

INTRODUCTION

Since 1992, Ghana has observed free and fair elections every four years, now including three changes of ruling party. Despite a recent history of peaceful and competitive elections, there was still concern that violence could tarnish Ghana's reputation as a stable democracy. In the words of one of our Ghanaian colleagues, "Ghana is seen as a beacon of democracy, and all [of the] eyes on us want to find out what is happening. Can we consolidate our democracy? Can we hold on to what we are known [for]?"

Like Ghana today, Kenya in 2007 "was considered an icon, a bastion of political stability and economic prosperity in Africa" (Kanyinga 2009). In the Kenyan elections of 2007, the publication of contested results set off two months of violent conflict across the country, in which over 1,000 were killed. "It surprised many that this icon would go up in flames so fast" (Kanyinga 2009).

Goldstein and Rotich (2008) discuss how modern technologies, like SMS (Short Message Service) messages and blogs, were used to promote violence and challenge mainstream media respectively, during the media shutdown that the Kenyan government had imposed during its elections in 2007. In those circumstances, Ushahidi[1] was conceptualized and developed. Ushahidi has since been used for crisis response. It crowdsources, curates, and maps reports from SMS messages, tweets (public posts on Twitter), and its own online platform.

[1] http://www.ushahidi.com

Current research on social media tools for crisis response focuses primarily on Twitter (Imran et al. 2015), but SMS has been widely used. This focus can be partly attributed to Twitter's open API, which lets external applications innovate with few limitations. In contrast, WhatsApp, a leading mobile instant messaging (MIM) platform, does not offer a public open API, complicating programmatic access. Other major MIM platforms offer limited APIs, and some have recently launched public APIs (Rosenberg 2016). Imran et al. (2015) argues the importance of extending crisis response tools to other types of media.

In this paper, we begin the argument that integrating MIM into crisis response tools can reach a broader diversity of users and discover incidents not found on other social media platforms. This paper describes the integration of WhatsApp into Aggie, a social media aggregation platform, during the 2016 Ghanaian elections. After introducing Aggie and the monitoring context, we describe the technical implementation for retrieving messages from WhatsApp. Then, we present an analysis of WhatsApp messages, associated incidents, and interviews with people involved in the monitoring process. Finally, we discuss the challenges of integrating an MIM platform into Aggie and the monitoring process and overview future work.

RELATED WORK

The use of social media in emergencies and crisis response has matured in the last 6 to 7 years (Imran et al. 2015). Several systems have been developed to help emergency response teams detect potential hazards and gain *situational awareness* from information found in social media (Rogstadius et al. 2013). However, most of these systems rely only on tweets, leaving out other major social media and communication channels (e.g., radio, MIM).

Twitter was one of the first practical mobile communication media that allowed people to broadcast messages from anywhere in the world to a connected audience. Li et al. (2012) mention several reasons behind Twitter's prevalence in systems for detecting incidents: tweets are public by default and Twitter encourages its users to share events in real-time. Combined with Twitter's wide adoption by the general public and the media, many newsworthy events and incidents appear on Twitter shortly after they have happened. In the case of CrisisTracker, Twitter data allows observers to reach places and communities they could otherwise not reach (Rogstadius et al. 2013).

Public broadcasting, e.g. tweeting, is a departure from the uses of traditional mobile communication channels (phone calls and SMS messages). These channels are mostly limited to a single receiver or a limited-size group. Current systems for crisis management and response have mostly ignored these traditional channels. Exceptions are certain crowdsourcing systems, like Ushahidi and Aggie (Smyth et al. 2016) as they have been designed to collect SMS messages with reports of incidents.

Mobile Instant Messaging

MIM platforms have expanded the capabilities of mobile phones. These are platforms which augment the phones' capabilities with instant messages and voice and video calls over the internet. People around the world are increasingly using MIM platforms. Of the top five social media platforms, four of them are MIM platforms with a combined 3.7 billion monthly active users; the leaders are WhatsApp and Facebook Messenger with 1 billion each (Statista 2016).

Church and Oliveira (2013) compare messaging practices on WhatsApp and SMS in Spain. They find that WhatsApp messages "tend to be more social, informal and conversational in nature" than SMS messages. In their research, users felt that WhatsApp was not a substitute for SMS. However, recent trends in Ghana suggest a shift from SMS to MIM. In Ghana, the number of SMS messages sent declined by 25.2% from the second quarter of 2015 to the second quarter of 2016 (National Communications Authority 2016). In the same period, the number of active mobile data subscriptions per person rose from 62.0% to 67.6%. In comparison, the phone subscription market in Ghana is more saturated: the number of active mobile phone subscriptions per person grew from 131.0% to 131.9% in that period (National Communications Authority 2016). In this environment, Ghanaian radio stations, which request contributions from the audience via phone calls and messages, are increasingly using WhatsApp messages instead (Avle 2015).

Previous Uses of MIM in Monitoring and Responding to Crises

MIM systems are now being used by emergency teams to coordinate action response and to receive reports of emergencies. In China, WeChat has been the selected platform by local authorities for reporting emergencies via MIM (Liu et al. 2015). Malik (2016) points to the increased efficiency of a group of engineers reconstructing roads in eastern India due to the use of a closed WhatsApp group. Engineers could quickly communicate with the area responsible with rich messages, and report to the District Magistrate without the need for meetings.

In one of the few analyses of MIM in practice, Debnath et al. (2016) suggests that WhatsApp group chats from emergency response teams can provide a wealth of information regarding the allocation and availability of resources in real time, as with the case of the Indian engineers. They analyzed WhatsApp group chats from the NGO "Doctors For You" during two post-disaster scenarios: the Nepal earthquake and the Chennai flood of 2015. They applied simple Natural Language Processing techniques to develop an automated system to look for relevant information in WhatsApp messages and endorsed the aggregation and automatic analysis of the internal messages of multiple agencies.

AGGIE AND THE SOCIAL MEDIA TRACKING CENTER

Aggie[2] is an open source web application for aggregating social media and other digital resources to track incidents around real-time events such as elections or natural disasters. Aggie allows organizations to extract key data from social media posts through automatic aggregation and manual expert filtering. To do so, organizations need to set up a web server with the Aggie application and configure credentials to use the APIs of selected social media.[3]

To aggregate content related to the monitored event, Aggie uses carefully chosen keywords, hashtags, RSS feeds, and public Facebook Pages and Groups. We refer to the posts and messages that Aggie collects as *reports*. Aggie can be used for monitoring any public event harnessing crowdsourced content from social media sources and specialized sources such as ELMO. Collected reports are available in Aggie as shown in Figure 1, a screenshot of the user interface of Aggie. The top bar is a navigation bar, while the second is a live statistics bar. The section below that is the "filter" section, where filters like medium (WhatsApp in this case), keywords, tags, and author can be used to view only relevant reports. The section below the filter section is the "reports" section, which contains the latest reports satisfying the filter condition. If no filter is set, all the latest reports are shown here.

Aggie has been designed to work within a Social Media Tracking Center (SMTC) to monitor elections. An SMTC is a group of volunteers who gather and work collaboratively around the clock to monitor social media reports using Aggie during critical events. Generally, an SMTC is organized for an event in advance; this involves recruiting volunteers, identifying sources of reports, and building relationships with partner organizations.

The key teams of the SMTC include the tracking team, the veracity team, the escalation team, and the embedded team. The tracking, veracity, and escalation teams make up the *monitors* of the SMTC and are co-located in a physical space. Additionally, the management team helps with the setup of the SMTC and the institutional collaborations.

The Tracking Team Tracking team members, also called trackers, use filters to read through each report that Aggie aggregates. When they find relevant, actionable reports, they create *incidents*—descriptions of events at a specific time and place—in Aggie.

The Veracity Team The veracity team processes incidents created by the tracking team. They investigate whether the incident is true by requesting additional information from the original source and, simultaneously, attempting to corroborate the incident with traditional media or the embedded team.

The Escalation Team When an incident is verified, the escalation team communicates with the externally located embedded team to provide information to the SMTC's partner organizations. The SMTC may publish fact-checking information regarding escalated incident. Verified incidents that have been sent out in this way are called *escalated*.

The Embedded Team Embeds—members of the embedded team—are members of the SMTC placed in civil organizations or government institutions who pass escalated verified incidents to these organizations and support them in responding suitably and swiftly to these incidents.

AGGIE AND THE 2016 GHANA ELECTIONS

This section discusses the preparation, implementation, and execution stages of Aggie for the 2016 Ghana elections.

[2] http://getaggie.org
[3] Complete documentation can be found at http://aggie.readthedocs.io

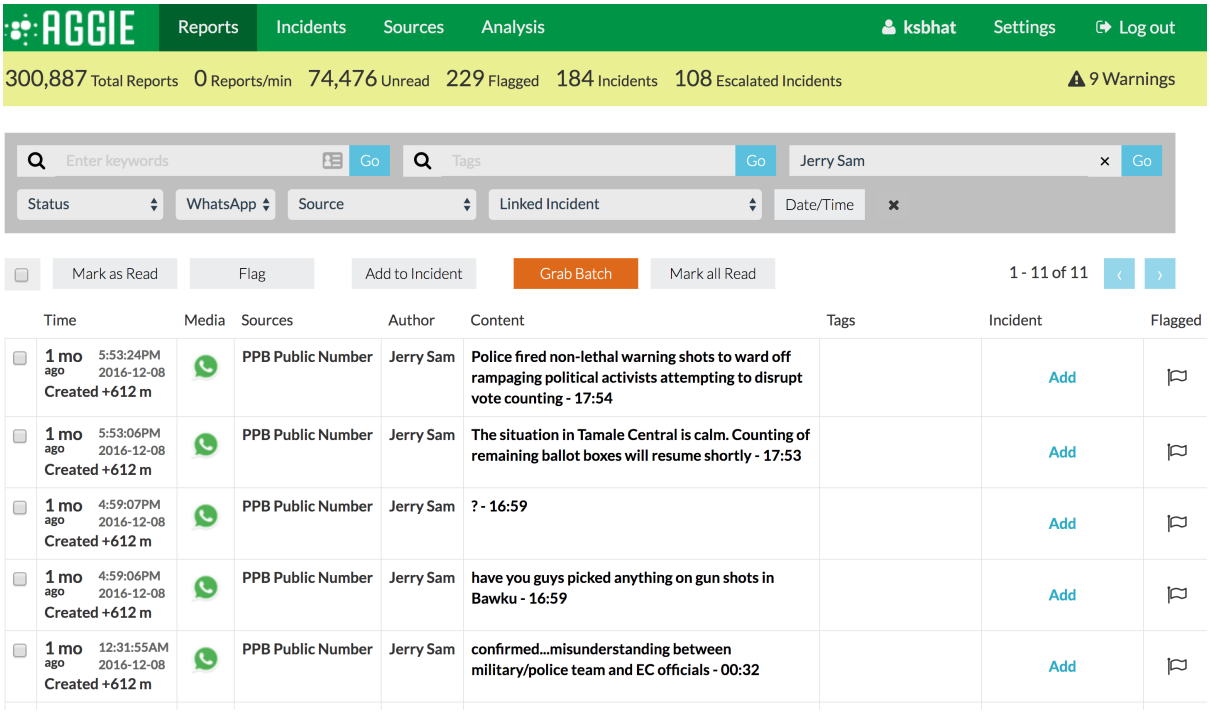

Figure 1. WhatsApp Reports in Aggie

Preparation

In January of 2016, the Executive Director of Pen Plus Bytes,[4] Kwami Ahiabenu II, got in touch with UNU-CS to request that we use Aggie to support an SMTC during the upcoming 2016 general election. Pen Plus Bytes had previously used Aggie in the SMTC they organized for the 2012 elections in Ghana.[5]

Leading up to the election, we worked with Pen Plus Bytes to design and implement new features for the Aggie software. For Pen Plus Bytes, who served as our experts on the Ghanaian social media landscape, supporting WhatsApp in Aggie was always an interest. Although we had determined that without a public API it would be too difficult to collect messages with Aggie, just before the election the Team Lead—the head of the SMTC—re-emphasized the importance of receiving messages from WhatsApp. While we investigated possible implementations for manually adding reports, we found the automated method of gathering WhatsApp messages described in the next section.

Implementation: Supporting WhatsApp in Aggie and the SMTC

Unlike Facebook and Twitter, WhatsApp has no space for public messages, and WhatsApp does not provide an open interface for logging in and programmatically accessing messages. Aggie's support for WhatsApp, then, is necessarily a *jugaad*[6] implementation—lanky and leaky, but functional.

WhatsApp is primarily an application for mobile devices, but there is an interface for web browsers called WhatsApp Web. When a user is logged in to this web interface and they receive a new message, this web interface sends a desktop notification to the operating system with the author and content of the message. For audio, images, videos, and calls, the content of the desktop notification is text like "Audio (2:21)" and the media file is not included. If the user has a conversation open, however, notifications are not sent for new messages in that conversation. Each WhatsApp account can only be logged in to one browser window at a time.

The Mozilla Firefox plugin *GNotifier*[7] can catch desktop notifications and use a custom command to "display" them. With the SMTC's WhatsApp account logged in to the web client on Firefox, we set GNotifier to forward the desktop notifications to the Aggie server (using cURL). The Aggie server parses the content and author of the message to create reports.

[4]Pen Plus Bytes is a Ghanaian governance, journalism, and ICT civil society organization.
[5]The current director of UNU-CS, Michael Best, led Georgia Tech researchers during the 2012 deployment of Aggie
[6]Hindi word that roughly translates to "hack"
[7]https://addons.mozilla.org/en-US/firefox/addon/gnotifier/

With this setup, Aggie can treat WhatsApp like any other source that creates reports to be read by the tracking team, with little change to the existing workflow and organization of the SMTC. This means it can collect and store WhatsApp messages that have been sent either directly to the SMTC's WhatsApp account, or sent on groups in which the SMTC's WhatsApp account is a member. However, this implementation introduces important technical limitations. For example, if the computer running WhatsApp Web loses internet access or power, Aggie can fail to collect messages from that period.

Execution: Running the SMTC with WhatsApp Support

The SMTC began officially (i.e. monitors began tracking, verifying, and escalating incidents) on the morning before the election, December 6th, around 11 A.M., and ended on the evening of the 8th, around 5 P.M. It was managed by a small team of Pen Plus Bytes staff, three researchers from UNU-CS, and one researcher from Georgia Tech.

Prior to the election, Pen Plus Bytes had established rapport with key institutions involved in the elections. Consequently, the SMTC had embeds at the National Election Security Task Force (NESTF) (1), the Coalition of Domestic Election Observers (CODEO) (2), and the Electoral Commission (1). The embeds were either Pen Plus Bytes staff or media experts. The NESTF and the Electoral Commission had set up their own social media monitoring teams to monitor the election. In the case of NESTF, the monitoring team used another Aggie deployment, without support for WhatsApp, provided by a local private contractor.

The SMTC used Twitter and a website[8] to disseminate information about the veracity of incidents, but the website had only 264 unique visitors while the SMTC was operating. And as of 18th January, 2017 the SMTC's handle—@GhanaSMTC—had only 486 followers. In coordination with the SMTC embed, however, the Electoral Commission, @ECGhanaOfficial which has 22.2k followers, published tweets which corrected some of the false reports that the SMTC had received.

During the election, the publicly shared WhatsApp account was a member of a set of 35 WhatsApp groups, mostly election-related (exeptions include bible study groups, for instance). The WhatsApp account was added to these closed groups by requesting access from the groups' administrators.

When the SMTC began, the researchers explained to the Team Lead how WhatsApp messages get into Aggie. Because of the risk that leaving a WhatsApp conversation open could prevent Aggie from collecting new messages from that conversation, the Team Lead was clear that access to the laptop running WhatsApp Web should be carefully controlled. It was primarily the Team Lead who responded to conversations on the SMTC's WhatsApp account, and usually only at the prompting of one of the authors.

During the SMTC, monitors created 184 incidents and read 226,405 reports of the 300,517 reports that Aggie collected from four different media. Table 1 links the reports with the incidents.

Table 1. Summary of reports collected by Aggie

Media	Reports Collected	Reports Attached to Incidents (%)
Twitter	249,556	535 (0.21)
Facebook	47,683	27 (0.06)
WhatsApp	2,804	18 (0.64)[9]
RSS	474	4 (0.84)
Total	300,517	584 (0.19)

STATISTICS FROM COLLECTED WHATSAPP REPORTS AND RELATED AGGIE INCIDENTS

The collected WhatsApp reports and the incidents they informed allow us to assess their impact and understand how WhatsApp was used for incident reporting during Ghana's 2016 elections.

[8] http://africanelections.org/ghsmtc/

[9] One report was added to an incident by one of the researchers and removed almost immediately, so this has been discounted in the future.

Aggie Incidents

After the election 184 incidents were stored in Aggie's database. 15 incidents had WhatsApp messages attachedThe Escalated column indicates whether the escalation team took any sort of action on the incident, whether that was publishing information on the SMTC's website or taking the issue to the Electoral Commission or NESTF.

Monitors marked 10 of the 15 incidents as escalated; 5 of the escalated ones were published on the SMTC website. Monitors determined the veracity for 10 of the incidents: 7 true, 3 false.

Of the 15 incidents with WhatsApp reports, 10 were unique; they were exclusively created with WhatsApp reports, and Aggie had no similar incidents. Only 4 incidents were submitted to the WhatsApp account by individuals directly, one of them by an SMTC member. There were 6 different political groups, 3 Ghanaian news groups, and 2 internal SMTC communication groups that contributed reports for incidents.

WhatsApp Reports

Table 1 shows that, proportionally, WhatsApp reports were used in incidents more often than posts from Facebook or Twitter. Only RSS posts (collected from five media outlets) outperformed WhatsApp messages on this metric.

To discuss the relevance and potential impact of the WhatsApp reports, we categorized them through manual coding. Test reports (5) were excluded from the coding. The categories for the coding were set up so that the first two, *Actionable* and *Follow-Up to Actionable Reports* would agree with the instructions given to the monitors. Each message was assigned a code by two of the authors. Disagreements between the two codes were resolved through discussion or, occasionally, a decision from the other author. During the coding process, we added and redefined categories; for each of these changes, at least one coder used the updated definitions.

In total, we used ten categories. In the following definitions of the categories, if Category A has *higher precedence* than Category B, reports which would otherwise meet the definitions of both categories are coded as Category A. Most of these decisions about precedence were made because for reports in the higher precedence category it is not practical to determine whether the report meets the definition of the lower precedence category, or because we gave more importance to the higher precedence category for this analysis.

1. **Actionable** Reports that could influence voting or election results (e.g. disenfranchising voters, spreading false news, potential violence) and have sufficient information to act upon.
2. **Follow-Up to Actionable Reports** Reports that provide important information (e.g. location, name, phone number) to support an actionable report (Category 1). This category has a higher precedence than Category 3.
3. **Relevant but not Actionable** Reports that bring information useful for situational awareness around the elections, but do not meet the standard for actionable reports. For the purposes of this definition, we do not consider election results to be "useful."
4. **Conversational** Reports that do not provide much information but are used to establish rapport with the monitoring team. In groups, these are reports that were directed to the SMTC account. (E.g. Asking SMTC for updates, addressing people monitoring the SMTC WhatsApp account.) This category takes precedence over Category 7 and Category 8.
5. **SMTC Internal Communications** Reports that were sent by SMTC staff directly to the SMTC account or that were sent to the Pen Plus Bytes WhatsApp group. Category 5 has been given precedence over all other categories to highlight WhatsApp use by the SMTC.
6. **Election Results** These messages contain information about the polling statistics from different constituencies that people reported, as well as (provisional) results of particular local races. This also included messages informing about concessions, trends, and winners' names in constituencies. Categories 1 and 3 have higher precedence than Category 6; overlapping reports would be those which have some actionable or relevant information in addition to election results.
7. **Other Election-Related** Messages containing election-related conversation, including relevant spam, jokes, and advice, as well as responses to election-related messages—even responses which are not, on their own, related to the election.
8. **Not Related to the Election** Reports gathered by Aggie that are part of different conversations and not related to issues around the election. They can be just propaganda, spam, or reports with little information.

9. **Non-Text** These reports contain no information apart from the kind of media that is sent, e.g. audio, video, photo, etc. Because the audio, video, or photo is not included in the reports, we cannot determine if these fall into any of the categories which require inspecting the content of the message. Thus, this category takes precedence over all others, except for Category 5.

10. **Not Understandable English** Messages written in non-standard English, or are only partially in English where the meaning of the message was lost due to language difference. Messages whose meaning we were unable to determine were classified in this category. If we had been able to understand them, it is possible that the messages could be classified elsewhere, so this category takes precedence over all others, except Category 5 and Category 9.

Table 2 presents the results of the coding of WhatsApp reports and the number of reports from each category which were added to incidents by monitors.

Table 2. Coded WhatsApp reports

Code assigned	Reports	Reports Added to Incidents
Actionable	39	10
Follow-Up to Actionable Reports	16	1
Relevant but not Actionable	67	2
Conversational	67	0
SMTC Internal Communications	152	3
Election Results	583	0
Other Election-Related	1,292	1
Not Related to the Election	270	0
Non-Text	292	0
Not Understandable English	21	0
Total	2,799	17

In addition to the reports added to incidents by the tracking team, we coded 44 messages as *Actionable* or *Follow-Up to Actionable Reports* that could have been added to new or existing incidents but were not. The reasons for their omission are not clear. Perhaps trackers were aware of the incidents described by those messages and had gotten information from other media already. However, it could also be that some of the messages did not provide enough information by themselves for the trackers to considered them actionable; since trackers read reports in batches that collect the latest fifteen unread messages, WhatsApp messages from the same conversation could end up in different batches and be read by different trackers.

The authors of the reports coded as conversational were likely expecting a reply from the SMTC to continue the conversation. Most of these were from individuals, although a few were from groups. Out 49 conversations with individuals, four resulted in creation of incidents.The 45 others consisted of messages asking for election updates and results.

The content of the reports coded as *Non-Text* were lost for us. Those from individual conversations were still attended to and acted on by the Team Lead when he considered them, but those reports did not end up informing incidents. Trackers did not have a way to evaluate those reports.

Reports belonging to SMTC internal communications consisted of messages sent to two Pen Plus Bytes WhatsApp groups and from two conversations with SMTC staff. Internal communication through WhatsApp resulted in trackers creating three incidents.

INTERVIEWS

As part of a wider research project on the roles of the various media in monitoring the election, we conducted interviews at the SMTC before and after election day. For the purposes of this paper, we have narrowed our analysis to focus on WhatsApp.

Method

Before the election, researchers interviewed three local media experts at the SMTC, one of whom became the SMTC's embed with the Electoral Commission. After the election, the researchers interviewed 17 monitors and the SMTC's four embeds. In addition, the researchers interviewed the three key people at Pen Plus Bytes in charge of running the SMTC.

The interviews were semi-structured and were audio-recorded. They typically lasted about 15 minutes for the monitors and 45 minutes for the others. Participants were not compensated; interviews were conducted in English.

The design of the interview for monitors and embeds is based on the *critical incident technique* (Flanagan 1954). Volunteers were asked to retrace the steps they took before critical incidents, i.e., when monitors found actionable reports, or when embeds communicated incidents to institutions. Questions for media experts and the SMTC management team were more general, focusing on their expectations of media impact and its realization.

These interviews were transcribed and the fragments related to WhatsApp were coded for the analysis. The salient themes are aggregated in four main categories: (1) Capabilities of WhatsApp, (2) Technical challenges in using WhatsApp for monitoring, (3) Organizational challenges in using WhatsApp for monitoring, and (4) Impact of using WhatsApp in monitoring.

Results

WhatsApp was a common, often organic, interview topic. Most of the challenges of WhatsApp were discussed by more than one person. Also, the impactful events around WhatsApp were well remembered by multiple people with different responsibilities, giving a clearer picture of what happened.

Capabilities of WhatsApp

Before the election, the experts were optimistic about the capabilities of WhatsApp, saying that it was easy to use and that it was cheaper than SMS. An expert suggested that since WhatsApp had multimedia support, it would be useful for internal communication and for people to provide evidence with their messages reporting incidents.

When asked about which media would most quickly disseminate news of incidents during the elections, interviewees argued for Twitter, Facebook, and WhatsApp. The Executive Director of Pen Plus Bytes felt most incidents would be discussed first on WhatsApp, given its broad availability. However, he noted that most of those discussions would happen in private conversations and thus not be collected by Aggie: *"WhatsApp is quite widely available, so it means that people can use it quite quickly. The challenge is that we have not figured a way of collecting all this content if they are not in the group. . . or they are not sending us messages."*

The interviewees were mainly concerned with the trustworthiness of the information coming in on WhatsApp. One of the experts explained his fear that fake news could easily jump from digital to physical when, for example, a child tells their parent the fake news they have read in WhatsApp, and parents then spread that in their community. An embed with CODEO said he was double-checking incidents sourced from WhatsApp to ensure that he was not wasting the CODEO volunteers' time.

In apparent contradiction, the NESTF gave more weight to the reports from WhatsApp because they considered them to be unique, according to the SMTC's embed there. One of the monitors summed up, *"In WhatsApp. . . anybody is just sending anything, so you can't really verify. But there's very good information [that] you see [on] WhatsApp. That's why [you] need people on the ground to verify [it]."*

Technical Challenges in using WhatsApp for Monitoring

Many monitors were of the opinion that the number of WhatsApp reports coming in were far fewer than they expected. 2,799 WhatsApp reports were aggregated during the monitoring period.

A major technical issue the monitors talked about was the lack of context in WhatsApp reports on Aggie. WhatsApp is used for either direct conversation between two users, or to converse in groups where multiple people can send messages to each other. Since Aggie presents each message as an isolated report, it is possible that crucial information was split across messages, and individually, they were incoherent. One interviewee said that WhatsApp messages would be more useful if senders would structure their messages better and include all relevant information in one message.

Organizational Challenges in using WhatsApp for Monitoring

The researchers observed that the lack of a designated WhatsApp monitor was a serious organizational challenge. Because most people at the SMTC had other designated duties, replying to WhatsApp messages was handled by the Team Lead, who already had many responsibilities.

One volunteer said that she was avoiding reading WhatsApp reports because she was not sure how to follow up with them. With sources like Facebook or Twitter, Aggie provides a link to the original report which monitors can visit and use to request additional information from the author. With WhatsApp, however, she had no link to follow, and did not know if she should send a WhatsApp message to the sender personally.

The SMTC's Team Lead felt that two way communication became difficult because there was only one account, and using the device during monitoring would affect Aggie's ability to aggregate WhatsApp messages. Eventually, a second number was used to reply, and the responses received were copied into the incidents' notes sections.

The Executive Director of Pen Plus Bytes felt that the use of WhatsApp at the SMTC was uncoordinated: between the SMTC WhatsApp account, SMTC members' personal WhatsApp accounts, multiple Pen Plus Bytes WhatsApp groups, and Aggie, there was confusion over how information should flow.

Impact of using WhatsApp in Monitoring

The Team Lead of the SMTC was positive about the crowdsourcing aspect of spreading WhatsApp messages requesting reports of incidents. He also used the metaphor of the helpdesk to describe interactions where the SMTC gave support to individuals, as opposed to groups of voters.

In one such scenario, a woman contacted the SMTC via WhatsApp, requesting help to vote by proxy. She believed she had met all necessary prerequisites to proxy-vote, but the officials at the polling center did not allow her proxy to vote on her behalf. The Team Lead talked to the woman and got in touch with the SMTC's embed at the Electoral Commission. Working with the Electoral Commissioner and the Electoral Commission's Public Relations Officer, the SMTC's embed at the Electoral Commission communicated with the woman and her husband via WhatsApp text messages and calls. Finally, the Electoral Commissioner's Public Relations Officer took over and resolved the issue with the voter's husband.

The tracker who saw the WhatsApp reports requesting help voting by proxy in Aggie also noted that WhatsApp practices may be more conducive to this helpdesk-style interaction than other platforms: *"a couple other people [were]. . . putting up their own problems in the [WhatsApp] group. And it wasn't more of [a] general thing like how Twitter was."*

The conversational nature of WhatsApp was a relief for verifiers. They were in charge of contacting back the authors of the reports, and noted that WhatsApp users will frequently reply, unlike Twitter users, who will rarely reply back: "*they get into the flow of talking about their problem, it keeps on flowing. Unlike the other [media] where it's more of like a one time [event]—others will retweet, but you're not finding the same person going on and on."*

DISCUSSION

WhatsApp messages improved the monitoring efforts of the SMTC. Ten of the incidents created used information uniquely from WhatsApp, and four of those were escalated. NESTF was clear that they trusted and valued reports from WhatsApp more than those from Twitter or Facebook. The volunteers and staff of Pen Plus Bytes were strongly positive on the importance of getting reports from WhatsApp in Aggie.

The ubiquity of WhatsApp within the SMTC and the ability of Aggie to collect reports from those groups streamlined the workflow of reporting incidents. SMTC staff and collaborators would forward reports and news they gathered independently to the internal communication group or in individual conversations.

The SMTC received significantly more messages from WhatsApp groups than from individual conversations; likewise, most of the actionable reports from WhatsApp were found in groups. Tapping in to existing election-related WhatsApp groups and the communities that use them was important for the SMTC. With a stronger publicity campaign to advertise the WhatsApp account before the election, the SMTC may have seen more individuals reporting to the WhatsApp account.

The impact of the created incidents is difficult to assess, as there is little feedback to the SMTC after incidents are escalated. The severity of the incidents appears to be low, but it is reassuring that the Electoral Commission was informed of the incidents as they were verified.

Unfortunately, even when the SMTC attempted to correct false information they had received in Aggie on the website, their reach was not as wide as hoped. The SMTC published many verified or refuted incidents on their website and in Twitter, but both channels saw low engagement.

Challenges

Although the SMTC was able to use the collected WhatsApp messages with some success, the workflow for WhatsApp messages was hampered by technical and organizational challenges. The addition of WhatsApp to the SMTC brought two kinds of organizational challenges, but they share the same root cause: that WhatsApp is used for a broad diversity of communications. For that reason, sometimes the lines between internal and external communication became blurred.

Integrating any MIM platform into Aggie would likely bring similar challenges; appropriately integrating MIM platforms into Aggie and the SMTC may require a more complex and flexible solution.

Future Work

The results presented here point to possible improvements to the Aggie software to be able to address larger crises with more incidents and more individuals reporting. For example, trackers could benefit from a filter in Aggie to reduce the non-relevant messages they see. In our case 56% of the WhatsApp reports were *Other Election-Related* or *Not Related to the Election*, which did not add information to the monitoring process. Due to the variability of conditions in elections, like monitored region, written language, and local trends, humans would likely still need to take a dominant role in the filtering process. Thus, solutions like supervised machine learning as presented by Link et al. (2016) are promising.

The emergence of chatbots for MIM provides a great opportunity to streamline conversations with individuals providing reports. While there is no support for WhatsApp, chatbots could be implemented in Facebook Messenger or other MIM platforms to guide individuals to give accurate and potentially structured event information, which could be forwarded to platforms like Aggie. Chatbots could also serve as a preliminary filter for non-reporting conversations.

CONCLUSION

The SMTC in Ghana benefited from Aggie's ability to monitor WhatsApp messages sent to the SMTC's public number: people used the new platform to communicate with the SMTC, and more incidents were created thanks to the information found in WhatsApp reports.

Other social media monitoring tools should consider taking advantage of MIM platforms. Despite the relative ease of using Twitter's API, most of the incidents we found through WhatsApp were unique to WhatsApp. In doing so, organizations using those tools should make concerted efforts to solicit messages from the public, but also to join groups that are relevant to the critical event. Organizations should also consider the recommendations of ICRC et al. (2017) regarding the use of messaging applications for humanitarian purposes.

The technical novelty of this paper is due in part to the fact that WhatsApp does not have an open API. Our implementation can be replicated quickly and has access to group discussions, but with caveats: only textual content is retrieved, and two-way communication is not supported. To overcome these issues, some other MIM platforms provide access to their API, for example through Nexmo.[10] Recently, Facebook Messenger launched a platform for chatbots (Rosenberg 2016) that could serve to gather reports from the public during crises and integrate them in monitoring platforms.

Finally, our coding of the WhatsApp messages should give other practitioners an idea of what sort of messages a MIM system could expect to collect in an election monitoring or crisis response setting.

ACKNOWLEDGMENTS

We would like to thank Pen Plus Bytes for all of their effort organizing the SMTC. We greatly appreciate all the volunteers who gave their time to staffing the SMTC and who participated in this research. Thanks to Ugo Fred, Amanda Meng, Andrew Bayor, Michael Best and Thomas Smyth for their assistance conducting our research. Also, thanks to the reviewers for their helpful feedback on this paper.

[10] https://www.nexmo.com/products/chat

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