

Politics and Volunteered Geographic Information
Reflections on the Kenya 2007 and 2013 Kenyan Elections

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Abstract

The mobile phone has indeed reduced the barriers to entry within the digital space. No other technology has been in the hands of so many people in so many countries in such a short period of time (World Bank, 2008). Accompanied with global positioning systems (GPS), mobile phones embedded with GPS chips are increasingly making it easier for the public to share geographic information and contribute to user generated cartographic content. Such technologies are indeed introducing a new form of public participation and new forms of digital citizenship.

Despite such advances in **technology**, employing such **technologies** has certain political and social implications. Challenges such as the digital divide and digital inequality as illustrated by Esther Hargittai continue to bedevil the use of such technologies. Moreover the shift of power from traditional geographic information producers to citizens is causing conflict largely over the quality and credibility of such user generated information. Through this paper, I seek to highlight how user generated geographic content (using mobile phone) could bring about more public participation while at the same reducing the effects of some of the challenges posed by the digital divide and digital inequality. As a study, data crowdsourced during Kenya's 2007 election and 2013 election through various channels is used to show different aspects such as credibility

of user generated cartographic information and how such forms of participation affect political processes. In conclusion, the paper delves into how volunteer geographic information could lead to new forms of engagement between the political class and the public.

Introduction

Volunteer geographic information (VGI) is a term coined by Goodchild to refer to the widespread engagement of citizens with very little formal qualifications in the creation of geographic information (Goodchild, 2007). The creation of such information has largely been a preserve of government institutions, non for profits and subject matter experts. VGI as a practice has been employed in different aspects simply because of its participatory nature, spanning areas such as urban planning to election monitoring. The ability citizens now currently have to create, share and disseminate spatially referenced data not only empowers local communities but also helps shape decisions that communities could make known to policy makers and the political class. Hence, such user generated geographic information has certain implications to social, economic and political processes.

Elections are a manifestation of public participation. Through an election, eligible citizens choose an individual to hold public office and entrust the individual with certain responsibilities due to them. Through this decision making process, citizens are able to evaluate and make their voice heard on how they want to be governed. This process being political in nature implies that information contributed by citizens not only helps shed light on the political process as a whole but also how such digital forms are likely to affect public participation. Could such digital tools improve participation? What is this kind of participation through ICT tools effective?

The invention of the mobile phone has introduced a new dynamic not only of how people communicate but also how people mobilize for common good. Great strides have been made in

computing and improvements in ICT tools have resulted in devices which were traditionally mutually exclusive to be embedded into one portable device. Gone are the days when the phone was exclusively for making phone calls, the camera for taking photos and the camcorder for taking video content. Today's average mobile phone provides access to other semi-devices which before were considered peripherals. Devices such as cameras or GPS (global positioning system) **chips**. These new devices or sensors are providing a wealth of data which could be used to augment public participation. From collecting data on air quality to crowdsourcing information during an election, the mobile phone is now a gateway for the ordinary citizen to engage with the political class and the general public (Goodchild, 2007).

Sadly, VGI as a practice is bedevilled with some of the challenges facing digital tools if not more. The challenge of the digital divide is not any different in terms of its application within the realm of volunteered geographic information. Moreover, challenges arise given the gradual change from institutions of power to ordinary citizens in creation and dissemination of such data. Cartography has for long been considered special and only a preserve of subject experts. Through this paper, I seek to show how geographic information which has been contributed by citizens has not only improved public participation but also introduced a new dynamic at how citizens understand their geography within the political realm. This is important in order to understand how they are likely to contribute such information. To understand public participation especially with the inherent challenges facing volunteered geographic information, this paper compares and analyses two data sets collected by citizens during the 2007 elections and 2013 elections. It offers a comparison between how citizens collected geographic data in the 2007 election and how different to data collected in 2013. The paper also highlights the quality of geographic data submitted by citizens in an environment where challenges of the digital divide exist especially if traditional producers are likely to embrace VGI as a whole.

Background work

It is important to put into perspective the theoretic foundations of volunteer geographic information in the context of the public sphere. The public sphere as depicted by Habermas is an area where individuals converge to freely discuss issues facing them and through such discussions bring about political action. Habermas argues that public spheres must have a spatial context (Habermas, 1962). What does this mean in the context of volunteer geographic information? The spatial nature as fronted by Habermas' theory on public sphere indicates political actions or events are related with location or geographic information. Such discourse and agreed upon action happened within specific locations or geographies. On the other hand, Benkler argues that with advances in technology, the power and connectivity of the internet has introduced what he terms as a networked sphere (Benkler, 2006). The major difference between their depictions of both the public sphere and the networked sphere is the spatial element. In one, citizens are able to exercise their democratic rights and have a say on their political future, while on the other, through the networked sphere, citizens are able to participate unhindered by the constraints of presence or geography. A great testament to this is the election process, where citizens not physically present can practice their democratic rights through electronic voting while those physically present could practice their rights at designated polling stations.

In this context, it is my opinion that volunteer geographic information is at the center of both the networked and the public sphere as depicted by Habermas. VGI in this case provides a channel through which public participation which was previously confined by geography available to a wider networked public. This has a two fold effect: an increase in public participation since participation is no longer limited to location and it also acts as a repository of civic action.

Given that volunteered geographic information operates on the same principles similar to crowdsourcing (Wikipedia, “crowdsourcing”), some of the challenges facing crowdsourcing are also evident within the space of volunteered geographic information. Despite VGI having fundamentally improved geographic data over the past decades, several concerns have been raised regarding the quality of the data contributed, the relevance of the data and general reliability of the data. One of the major challenges facing volunteer geographic information is the credibility of the data. This is important especially if public participation is to be effective especially in distributed publics.

Credibility in volunteered geographic information is a necessity if such data is to bring about policy change or empower communities. Digital tools have lowered the barrier to entry in content creation and production and more so mobile phones continue to make this possible. This has resulted in a lot more data being contributed by citizens and an increase not only in the number of sources of information but also in the type of information contributed. This data could take the form of visual, audio, audiovisual or sensor information. With this information overflow, ensuring credibility of the information and their respective sources becomes a daunting task (Flanagin et al, 2008). As highlighted by Flanagin, the use of gatekeepers helps in sifting through information and in the verification of data contributed by citizens. This helps in ensuring some level of credibility. Moreover, he argues that credibility is an issue of trust and expertise more than that of accuracy. He is of the opinion that the information science field perceives credible information as that which is accurate hence relying more on expertise. He further argues that viewing credibility as a perceptual variable accommodates the core issues facing volunteered geographic information. Viewing credibility this way provides for a better understanding of knowledge production that is collaborative and distributed (Flanagin et al, 2008). Modern applications of VGI are less about spatial accuracy and more about information or opinion.

Therefore having VGI applications where credibility is looked at through the lens of perception, is more valuable for social and political processes.

Another pitfall facing VGI is that of the digital divide. As Esther Hargittai states in 'The digital reproduction of inequality', the digital divide is a term used to refer to the unequal distribution of the medium (Hargittai, 2008). One important element she highlights is that of access. Not all members of a specific community have access to the medium. A good case study of this is the internet. She argues that looking at access to the medium is a very simplistic way to look into digital inequalities. A more refined approach considers different aspects of the divide, on details such as quality of equipment, autonomy of use, social support networks, experience, user skills in addition of different usage types (Hargittai, 2008). Though Hargittai's study on the reproduction of digital inequalities focussed on the internet, she notes the same patterns were manifested in the use of mobile phones. She also notes that those with a higher level of education were more likely to own cellphones than those with little or no formal education. To better understand the question of access to the medium, it is important to look at some of the background research around mobile phone use statistics over both election periods.

According to a World Bank report on mobile penetration for those who they categorize as bottom of the pyramid, there has been a steady rise in the acquisition of cell phones since 2000. The World Bank defines the base of the pyramid as the section of the population that live on less than two and a half dollars a day (World Bank, 2013). As at 2009, approximately one year after the 2007 elections, 60 percent of Kenyans who fall in this category owned a mobile phone (RIA, 2012). This shows access to mobile phones had increased. Though it is important to highlight that this increase could be as a result of a favourable tax regime when the government zero rated tax imposed on mobile handsets in June of 2009 (GSMA ,2011). According to the same survey, of the 40 percent who did not have access or ownership to a mobile phone, 87 percent

cited affordability as the main issue as to why they did not own any phones. This does show indeed access plays an intrinsic role in affecting processes that employ ICT tools. As Hargittai rightly notes, there is need to look at the digital divide more than just from the element of access. Looking at the question of use, the survey done by RIA in 2012 shows that all respondents mainly use the mobile phone to make and receive phone calls. In second place, 82 percent of respondents interviewed use short messaging services while in third place 77 percent of respondents use cellphones to send and receive money. Only 25 percent of the respondents surveyed use the internet (RIA 2012). According to the industry regulator, Communications Commission of Kenya (CCK), internet penetration as at May 2013 stood at 41 percent, in June 2012 at 35 percent while in September 2011, the penetration rate stood at 22 percent. In the year 2013, more people were gaining access to the internet and most accessing it through mobile phones. On the other hand, mobile phones with GPS chips are increasingly growing in number. Nine percent of the respondents surveyed had smart phones implying they have some form of rudimentary GPS able to share more accurate geographic information. More than half of the respondents had basic phone with no internet while a paltry 37 percent had feature phones with the ability to take photos and connect to the internet. The report goes on to highlight that in the short term, to bring more inclusivity especially when dealing with participants who have challenges with access, platforms that could help include voice, SMS, USSD and SIM based applications. In the context of volunteer geographic information, it is safe to conclude that SMS would be a great channel to source such information despite possible challenges in the accuracy of the volunteered information.

The Kenya case presents a very interesting perspective in as far as that some of citizens had mobile handsets without any internet connectivity and volunteered information in the form of short messaging services (SMS). Of course, SMS as a messaging platform has its pitfalls

specifically because SMS does not have any location metadata which could make verification easier for gatekeepers. The only way to derive location data is through contents of the text message itself. This would involve parsing message contents into an entity extraction tool, and then geo-parsed to obtain location information.

Language is another important aspect to consider when looking at VGI applications. Another dimension that has not been extensively investigated is the relationship between linguistic groups and digital inequality. One of the comprehensive studies done showed the dominance of English as the language of the web (OECD, 1997), specifically so in the production and distribution of content. Citizens should be able to share not only the accompanying metadata in a language that is easy for them, but also one in which that does not prove to be a barrier to participation. One of the advantages of geographic information is its indifference to language. Names of places are easily identifiable across languages and at most times might not need any translation across languages.

It is necessary for purposes of this research to highlight the subtle difference between VGI and Participatory Public GIS or PPGIS in short. PPGIS as a term came into the fore in 1996 during a National Center for Geographic Information and Analysis meeting where it was described as the field of geographic information systems that seeks to enhance public participation and foster the empowerment of non-governmental organisations, grassroots groups and local communities (Sheppard et al. 1999, Sieber 2006). On the other hand, Tulloch argues that this formal definition is 'nebulous' and generally inconsistent (Tulloch, 2008). According to Gregory, PPGIS may be sanctioned by government as a means to expand public participation and consultation (G. Brown et al, 2013). Further to this, he asserts that both VGI and PPGIS involve investigation and identification of locations that are important to individuals while the major difference being their respective purposes. He is of the opinion that PPGIS's main purpose

is to inform planning and policy while that of VGI is the participants enjoyment. Though it does appear that the difference between VGI and PPGIS is more of an issue of semantics (Hall et al. 2010).

Methods

In order to understand how VGI has been employed to improve citizen participation and engagement, this study involves the analysis of two crucial datasets. One of the datasets was the Ushahidi legacy instance reports registered on the site during the 2007- 2008 post election aftermath while the other is based on the March 2013 election reports. It is important to note that there are several differences between data collected between these two datasets. One of the differences is that in 2007, the Ushahidi software was not as fully developed as the version deployed during the 2013 election. Though it is important to highlight that the principles are basically the same where citizens were able to report via SMS, email or social feeds to the website. Another key difference between both is with the support teams available. The 2013 instance had more technical and stand-by volunteers ready to assist in verification of reports. Some of these volunteers were specifically tasked with monitoring the election under the umbrella of an organisation named the Constitutional and Reform Education Consortium (CRECO). The main form of data transmission from the volunteers was through text messaging to the 3018 shortcode. Given the nature of SMS being limited to 140 characters, some of these volunteers were provided with election instruction cards to guide them with number codes to send so as to reduce the amount of text to write as they collected the data. This was to make the data collection process easier. The total number of monitors during the 2013 election monitoring process were 550 in number while the codes provided in the card were 48 in total.

The process of data collection by some of the volunteer monitors was relatively easy. All they needed to do was to send SMS details using a specific code to the shortcode. Location information of the monitors was derived from the geo-referenced metadata of polling stations they were assigned to monitor. For the general public, who had no training and the election instruction code, all they needed to do was send a text message and they would receive feedback from the service. Citizens with smartphones that were GPS enabled were also able to directly submit reports with more refined location properties to the Ushahidi instances. A team of volunteers would then scour this vast information and try to verify and ascertain the credibility of the information before sharing it with the wider public. In certain cases, they would call back or text back for more information.

The data for comparison purposes in the case of the 2007-2008 dataset spans from 11th November 2007 all the way to the 8th of April of 2008. In the case of the 2013 dataset, the data was contributed from as early as the 1st of March to 5th March the same year. It is important to note that the election was conducted on the 4th of March. Total reports for the year 2007 used in this analysis were 214 reports while in the case of the 2013 election 2500 messages resulted in approximately 1500 reports.

Some of the assumptions being made are that an increase in mobile phone penetration would not have drastically affected the number of reports. In 2007 the mobile phone penetration stood at 53 percent while in the year 2013 the penetration stood at 70 percent. It is for this reason, 17 percent could bring about more participation but given the difference in reports in 2013 and 2007, there is no way this difference could have been attained by such an increase.

Results

The importance of feedback loops

To understand participation within the electoral process, it is important to put into context voter registration statistics. Comparing voter registration during both election periods, the statistics show a great level of resilience by the Kenyan public to participate in the electoral process after the 2007 bungled election. Six months prior to the elections, the electoral commission was worried that voter apathy was likely to affect voter registration numbers due to the post-election violence and fear of victimization (Standard Digital News, 2008). At the tail end of the voter registration process more than 70 percent of target voters had enlisted as voters indicating their willingness to participate in the election.

Feedback loops as described by Tiago alludes to the idea that citizen engagement is followed by some kind of responsiveness (Peixoto, 2013). He further argues that the term is largely ambiguous resulting to it gaining several meanings. For purposes of this paper, we use the term “feedback loops” as described by Peixoto. How have feedback loops increased participation in comparison of the 2007 and 2013 election monitoring projects? And how have such feedback loops improved the ability of citizens to provide geographically referenced information?

In the 2007 election data, analysis shows very little direct feedback to citizens who submitted reports. On the other hand looking at participation by citizens who submitted information, a total of eight volunteers sent in information more than once. As depicted in the chart below, of the eight volunteers, the geographic extent of their submissions spans several geographically dispersed areas. This has two implications, the official gatekeepers were also responsible for collecting the data, hence repeat interactions. That since official gatekeepers can not be geographically present at several places over such a short span, the accuracy and credibility of geographic information is in question.

{need to add graph on 2007 repeat participant and location information}

In contrast, in the 2013 election data, as part of the process of messages being sent in via SMS, citizens would receive an acknowledgement thanking them for their contribution or asking for more information. In most cases where the feedback loop involved some form of data clarification, the additional data sought back implied geographic properties. The 2013 dataset presented a challenge as no accompanying user profile information was provided, largely to safeguard privacy. To counter this problem, the research involved scouring the entire dataset for repeat reports that show a form of trail of conversation. As noticed in most of the reports sourced via text messages, if no location information was provided, citizens would receive a text message asking them to text back their location. A simple mechanism to get better location information via a feedback loop. A sample message is as depicted below.

From Shianda

*254728***** - From Shianda*

3002 - Thank you for sending a message to Uchaguzi. What is the closest town or city for your last message?

*254728***** - Mumias east const Shianda t♦_wn, eluche ward ie mukambi primary school - View Report*

3002 - Thank you for sending a message to Uchaguzi. What is the closest town or city for your last message?

*254728***** - Ballot papers were not enough which consumes some time at around 4:15 pm*

*254728***** - 19*

*254728***** - Identification Kit Not Working*

The data also points to the fact that citizens are ready to share location information through SMS. Most of the reports sent in via SMS contained some form of location details that were in the form of recognized political boundaries. The location information could be in the form of state level boundaries, local constituency boundaries or to local polling station names. This further shows that the public have options over the level of accuracy and finesse of location

information. That is they have the option to choose how fine or coarse the location details being shared can be.

Feedback loops also help in increasing the frequency of interaction with citizens. Through such crowdsourcing techniques citizens can send frequent updates on the situation on the ground. The sample message below is just a sample of how this citizen monitor sent in reports on the situation during the end of the campaign period to the actual voting process. Unlike the previous message, this voter used a different level of location coarseness, settling on the constituency parameter.

Voting is still going on peacefully,

Similar messages:

(#4578) 254723****66 - Voting is still going on peacefully,

(#3414) 254723****66 - Hi,the voting process is going on peacefully in Nandi/hills constituency

(#2548) 254723****66 - Morning,am in Nandi county,Nandi hills constituency,voting is going on well and peaceful here

(#1963) 254723****66 - Hi,Nandi/hills constituency is peaceful

(#1845) 254723****66 - Hi,am in Nandi county Nandi/hills constituency,the campaigns ended peacefullyi have not heard or witnessed any form of violence being planned

What next after citizens submit that report? How can civic actions be inspired by such crowdsourced data. Crowdsourcing this information needs to provide some value back to citizens not only to make such initiatives sustainable but also more participatory. In the case of Uchaguzi, some of the election monitors' role was to verify the information and take specific actions. Actions such as following up with law enforcement or with the electoral body carrying out the election. Out of the total messages filtered on to the Uchaguzi platform, a total of eight reports resulted in specific actions. Two of the actions included arrests due to voting

malpractices while others dealt with the basic electoral process such as queue management and provision of power for the voter identification kits.

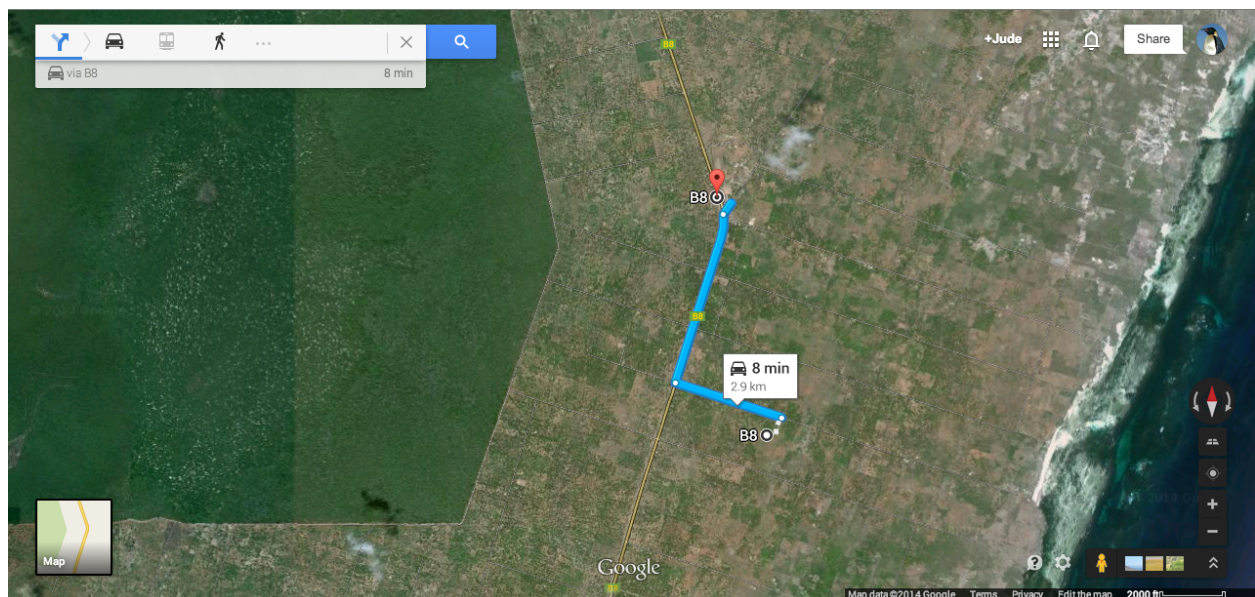
Same event different participants

Given the nature of crowdsourcing, it is more than likely to have situations where reports are received by more than one person or entity regarding the same event or entity. This not only helps make the process of verification easier but also help in building a credibility model for crowdsourcing based on trust. Though only once instance of the same event was reported by more than one participant in the Ushahidi 2007 deployment, the 2013 Uchaguzi deployment registered more reports referencing the same event by diverse participants. Having several participants submitting information relating to the same event or entity has a two fold effect. One of the effects is the ability to verify information given it has more than one source while second, it presents the opportunity source more accurate geographic information. To highlight this, the table below shows two different reports registered by two different participants. Both participants submitted reports at different times during the same day.

	Participant 1	Participant 2
Date and Time	3/4/2013 8:14:00	3/4/2013 5:01:00
Message text	Kilifi northchonyi polling station iebc officials kidnapped were beat up n cut using pangas they are currently taken to kilifi district hospital	Chumani Primary School, IEBC Officials attacked and kidnapped by people claiming to be mrc Now missing and threats to

		people who want to vote have been issued
Location co-ordinates	-3.492747,39.9025	-3.4722,39.898189

A quick geolocation search for both location names, that is Kilifi “northchonyi” polling station and Chumani primary school returns only a result for the latter and a very poor result for the former. Despite this inaccuracy in the text, the coordinates are merely 2.9 kilometers apart as depicted by a simple Google Maps location service search.

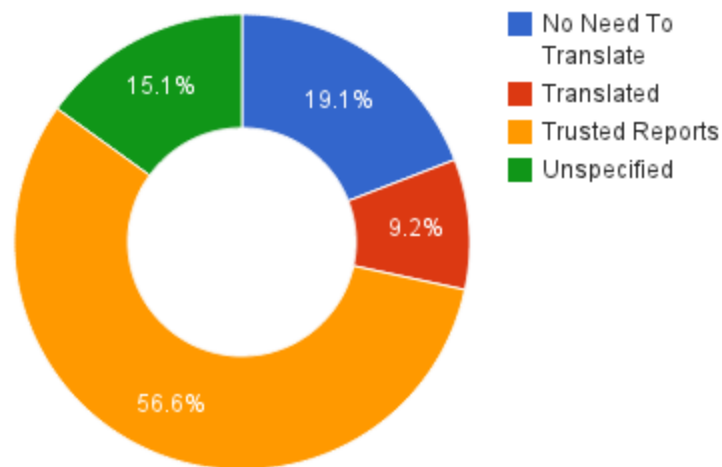


This indicates that having a diverse set of participants submitting reports about the same event or entity not only helps in providing the different perspectives of the participants but also act as a mechanism for verification and for the provision of information updates. Hence make it easier to trace crowdsourced data flows over time.

Supporting multiple languages

Mobile phone use also faces the problem of language inequalities similar to that facing the internet. With increasing globalisation, mobile phones now have embedded language support for different markets and support more languages than ever. This has helped in bridging the language barrier facing adoption of digital tools and technologies and enabled members of the wider public to communicate in languages they are more comfortable in thus enhancing participation. None of the reports logged in the Ushahidi 2007 instance needed any translation. In contrast, despite having monitors who were well versed in English, 9.2 percent of reports received in the 2013 election mapping platform required translation. As depicted in the chart below, slightly less than half of the reports were submitted by non- CRECO monitors. It is from this specific group that all messages that needed translation were source from. Surprisingly, on analysis of the contents of the text messages, location parameters largely remained the same regardless of the language. This means that one can derive location parameters without the need to have message contents translated.

Reports in relation to translation



In the chart above unspecified reports are reports which as per the data retrieved do not have any translation information. On inspecting some of these reports, most are in English. These reports could be in the same category as those that needed no translation. The translations were mainly from Swahili to English or from mobile texting culture which is a form of shorthand. Other languages translated were Kamaba and Kikuyu. Two sample reports are as highlighted below are used to illustrate this further.

1. *"There is a mistake at bomet nimejaribu kutrop twa kari eti wananiambia mi wa ngwinginge wamenikujapa kwa sweetwater bomet pliz we nite 4 asistance"*

2. *"karozi xema am jaymo encouraging all de kenyans 2 maintain peace b4 and afta elections"*

The first message is neither in proper English nor Swahili. Gatekeepers or moderators who understand the local dialects and slang are better placed to provide translations in

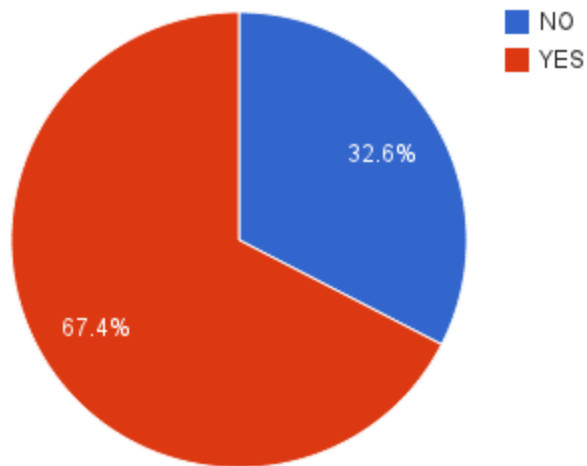
circumstances as shown above. It also shows location information by the delimitation named “Bomet”. The second SMS shows the influence of pop culture on communication and messaging.

The credibility of volunteered geographic information

As Flanagan notes, viewing credibility as a perception variable rather than “credibility as accuracy” affects some of the root issues facing volunteered geographic information. This presents a challenge and rift with traditional producers of such geographical information.

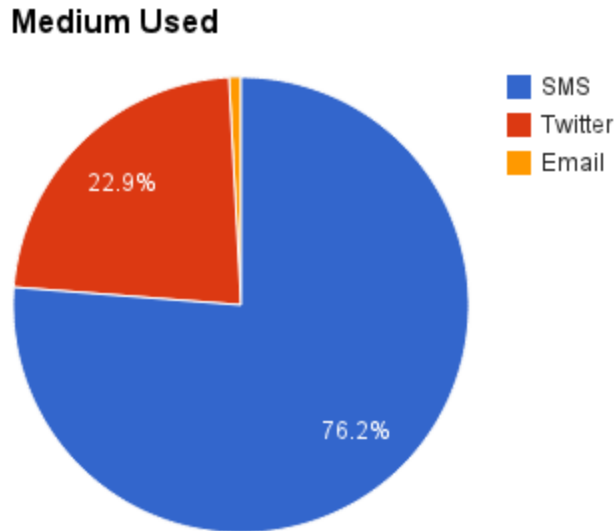
Geographic information gathered by individuals with little training has raised and continues to raise much debate on the quality and reliability of such data. Most of the data sourced from the Uchaguzi platform during the 2013 election was mainly collected by such individuals. Given one of the principal functions of gatekeepers is to check on aspects of credibility of volunteered information, it goes without saying that credibility is a subjective process. Based on the gatekeeper’s perception and understanding of the crowdsourced data, they determine how credible the information is. The illustration below shows the ratio of reports verified and those that were not verified.

Distribution of Verified Reports



Supporting different ICT Tools

Within the context of the digital divide as espoused by Esther Hargittai, providing several and different ICT tools could bring about more inclusivity. Short messaging as a medium is not only cheaper but also easier to use unlike the use of custom mobile applications and the internet. The Ushahidi legacy application (2007) initially supported crowdsourcing information from verified news feeds and presented the mapped feeds to those who had access to the internet. Later on during the deployment, support for short messaging was introduced. In the Uchaguzi deployment for the 2013 election monitoring, the different medium used to crowdsource information include short messaging, email and social media. The chart below shows the distribution of different mediums used to contribute data in the 2013 deployment.



How does the medium affect the sharing of geographic information? SMS as a platform is limited as a medium to share very accurate geographic information. Though it is important to highlight sending picture messages using MMS results in more accurate geographic information. This is mainly due to the nature of MMS which stores geographic metadata. Twitter on the other hand implies that those who prefer this medium have access to the internet. Location accuracy of reports through twitter indicate a higher level of accuracy unlike messages collected via SMS. Accuracy to the level of latitude and longitude pairs. Email as a medium also presents a challenge. One of the ways to source location properties from the producers of such geographic information is through the use of internet addresses. This may not be as accurate as based on a country's internet architecture, IP addresses may not be useful in relating digital assets to physical space or location.

Conclusion

Volunteer geographic information as a practice introduces a new dynamic in the form of user generated content. Flanagan rightly notes and specifically to VGI, that there is a need to understand the motivations to contribute such content and the end goals of collecting such content. In the case of Ushahidi in 2007, the goal was simply to monitor violence hot spots, unlike the Uchaguzi deployment which took on a more citizen monitoring role. The motivations of the two different deployments were slightly different. On one hand the earlier deployment was more crisis monitoring while the second involved a monitoring a political process. Such motives are subject to greater or lesser political bias hence the need to improve mechanisms for verification to bridge the gap between citizen cartographers and those who produce authoritative cartographic products. By employing feedback loops, not only can we improve the quality of volunteered geographic information but also improve participation. Participation is increased as citizens have a means to not only to self organise but also as a channel of communication with the political class. Also within the political class, the use of location information has helped them connect with the public. An example was one of the presidential candidates who would share location information through his social media streams of his campaign and public rallies. This has resulted in a change within the political space where some leaders now not only volunteer geographic information on their campaigns but also on different projects and events that form part of their daily routine.

Further research is required in determining relationships between how the feedback loop could be closed between the political class and the citizenry when elections are over. How can citizens continue to hold their leaders accountable. Can they use volunteer geographic information to hold leaders accountable for specific projects or promises made to them. A great example is how Nigeria used citizens to crowdsource the quality of work by contractors. Another example is in Uganda where university students report lecturers who failed to turn up to class

and share this information with the wider public. What is common in such monitorial projects is the location element. If citizens are to be empowered to make the most out of geographic properties in order to affect political processes, then improving VGI practices would greatly help.

More needs to be done on how such a participatory process can have its products or output also presented on the mobile phone. No platforms exist that help in providing spatial context to other contributions. For instance, if a voter sends in a report from a polling station, there is now way to receive updates based on their specific location from other voters perhaps at the same polling station. The use of geofencing push and pull updates would greatly enhance participation and likely to produce more accurate and credible information.

VGI has also been used in developed countries for city planning purposes and obtaining feedback from citizens on city plans. As the world moves toward digital representation, political processes such as political boundary redistricting could employ VGI to source opinions on delimitations by the public. Given redistricting and issues of gerrymandering could occur, it is interesting to see how such political actions could be represented through volunteer geographic information and what rules would be made to prevent gerrymandering. As highlighted, despite increased participation, there is the risk of interest groups mobilization. Brown illustrates in his control group on how interest groups mobilized and affected the overall public participation and possibly leading to disenfranchisement(Brown et.al). In the case of the Ushahidi 2007 deployment, the data is not sufficient to determine any interest groups which mobilized in one form or the other. Uchaguzi on the other hand, one could argue that interest groups included agencies who provided and trained the monitors though it is not easy to discern any interests from the data. It is important to highlight that a slight majority of the reports did emanate from monitors of this mobilized interest group. Did this affect the overall participation? This is indeed difficult to tell.

Though effects of the digital divide exist, VGI has greatly helped in increasing public participation in several areas not to mention politics and policy. To counter some of the challenges caused by the digital divide, there is the need to employ several channels that cut across race, gender and class. Provision of free communication channels such as a free SMS gateways also help in lowering the barrier to entry and providing feedback loops helps in increasing participation and engagement. Gatekeepers as referred to by Flanigan, are also vital in ensuring credibility of the data volunteered though more tools could be made available to them help assess credibility not only based on their perceptions but also credibility based on accuracy.

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