OPEN DATA IN DEVELOPING COUNTRIES

UNDERSTANDING THE IMPACTS OF KENYA OPEN DATA APPLICATIONS AND SERVICES

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EXECUTIVE SUMMARY

The Kenya Open Data Initiative was launched in 2011 and received great government support to provide access to and utilization of open datasets by the population. Technology tools have also been built to synthesize and visualize the data in simple formats in order to improve access to this government information. Three years later, there has not been substantial documentation of level of use of these datasets or of technology applications built using this data. Further, there is little or no recorded evidence to support consequential social impact of these initiatives and technologies or the way grassroots citizens engage with government data.

iHub Research set out to study and assess the implementation and impacts of initiatives that use data from Kenya Open Data Initiative's (KODI) portal (opendata.go.ke). These initiatives include Code4Kenya, an outreach initiative supporting intermediaries to work with government datasets to develop applications and services that make data more accessible and that improve governance, as well as independently created open data applications. The research aimed to explore the extent to which these open data applications affect access to and use of government information in relation to service delivery within the sectors of Water, Health and Education.

The research used a mixed method approach, which combined qualitative, quantitative and experimental methods. This was necessary to provide a holistic view of the status of open data awareness, access and use in the country and help us better understand the underlying factors that affect the roll out, adoption and use of open data. These methods included a literature review, a user perception survey, dashboard data analysis of the open data applications, in-depth interviews with key stakeholders and a user experience experiment on three open data platforms. Findings from these techniques were aggregated and cross-analyzed to measure the extent to which technology intermediaries have increased the accessibility and utilization of open data in Kenya.

KEY FINDINGS

Citizens do access and use government data, but know little about KODI – this finding signifies low outreach and awareness raising at the grassroots by open data stakeholders despite demonstrated demand for government information by citizens. 62% of survey respondents stated that they currently received information on services from the government. Nonetheless, there was very little knowledge of KODI and open data among our respondents with only 7% of all respondents having heard of the open data government portal. None of our respondents was aware of any of the Code4Kenya applications or other open data applications covered by this study. It was therefore difficult to ascertain widespread impact of these technology tools on grassroots communities given that these community members were hardly using open data.

Low quality of the available data is hinders its usage and limits its value -The low quality of the data available through opendata.go.ke greatly hinders the use of the data by technology developers and the public. The following were identified as the key contributing factors to the low data quality: prevalence of irrelevant information/data of little interest, outdated datasets in the platforms and poorly structured data. This resulted in few active open data initiatives or applications with outdated or inaccurate information that could be limit its value to grassroots communities and potential for impact.

Well-designed and implemented intermediary technology can enhance access and usability of open data - Research participants found the KODI platform difficult to navigate and could not easily access the specific information they were interested in. However, when using other third-party provided applications they found it easier to navigate and extract the information of interest to them. This finding showcased the potential value and importance of open data intermediary technologies in improving access to information and increasing the public's utility of open data.

Based on our findings we put forward a framework with suggested ideal factors that would increase the utilization and impact of open data intermediary applications, including extensive outreach efforts to drive demand for data, and improving quality of data on the platforms, and platform usability. We identify the need to pay special attention to the choice and structure of data provided by iteratively seeking feedback from users, both the technology intermediary creator and the general public. Finally, we propose an acute awareness of the contextual framework in which an open data initiative exists, including social, political and legal contexts.

"Understanding the Impacts of Kenya Open Data Applications and Services" is a one year study that iHub Research has been conducting as part of a two-year research program titled 'Exploring the Emerging Impacts of Open Data in Developing Countries' or, commonly referred to as, Open Data in Developing Countries (ODDC). This research program is coordinated by the World Wide Web Foundation, and funded by the Canadian International Development Research Center (IDRC).

INTRODUCTION AND BACKGROUND

Open data, as defined by various key stakeholders, covers more than just the availability of information; the underlying principle is that the data should be freely available to everyone to use, republish and share as they wish, without restrictions from copyright, patents or other mechanisms of control (Auer, et al. 2007, OKF-Open Knowledge Foundation 2011). Two main civil society movements have promoted open data: one that promotes freely available information from a human rights perspective and the other as a way to promote good governance and economic opportunities (OKF-Open Knowledge Foundation 2011).

There are numerous benefits and incentives for both the entities holding the data and the ultimate users of the open data - government, public institutions, academia, private sector and the general public. These benefits include transparency and accountability, innovation, active citizenry, open research, among other benefits that spread to numerous other sectors; "In addition, openly accessible data provides information, knowledge and wisdom that have the potential for a number of social, economic and environmental benefits" (Reitano 2013).

Open data movements have been most popular in developed countries with the earliest open data initiative launched in the US by President Obama in 2009 (Mutuku, Colaco and Omenya 2013). In Europe shortly after, the European Commission, EU member states and civil society quickly launched open data initiatives after the EU Directive 2003/98/EC was made to set a basis for creating a common framework for availing publicly owned data (Schwegmann 2013). In Canada, the open data initiative has availed opportunities for researchers and start-ups, as (Reitano 2013) describes, "great benefits of publishing OD lies within research and development and is highly likely to create and support innovation."

In developing countries such as Kenya, however, the uptake of open data initiatives is much slower, but signs of progress exist; developing countries owned 12 of the 41 national open data platforms launched by 2013. Kenya was the first Sub-Saharan and second African country to launch its open data Initiative after Morocco, later followed by Tunisia and Ghana. Continental data is provided through a platform developed by the African Development Bank, which became the first African regional entity to do so (Schwegmann 2013, Mutuku, Colaco and Omenya 2013).

KENYA OPEN DATA INITIATIVE (KODI)

The Kenya Open Data initiative (KODI) was launched in July 2011. The purpose of this initiative was to make key government data freely available to the public through a single online portal (Kwamboka 2013). The portal hosts more than 400 government datasets. The 2009 census, national and regional expenditure and information on key public services such as education, health and agriculture, were some of the first datasets released[1]. Kenya was a pioneer in launching such an initiative with the main objective of "helping in propagating better governance through the implementation of the new constitution" (Mutuku, Colaco and Omenya 2013).[2]

Through this portal, data is provided on a free-to-use license in accordance with the principles and definitions of open data (The Open Knowledge Foundation n.d.). Open Government Data further outlines 8 principles[3] of open data that include data completeness, timeliness, accessibility, ability to manipulate, non-proprietary and license-free. In accordance with the open definition requirements, the data on the portal is open for manipulation by users and the portal provides different views of these datasets. The most notable formats include spreadsheets, charts, tables, and digital maps. The portal allows for manipulations on the datasets with some of the possible actions including filtering, visualizing, exporting and embedding data into other websites.

THE CODE4KENYA INITIATIVE

Despite the efforts to avail government datasets openly through KODI, utilization of data from the portal was not as widespread instantly as expected. Therefore, a fellowship and outreach initiative, Code4Kenya[4] was conceptualized. This initiative in the form of a pre-incubator[5] was launched and run from July to November 2012 in a bid to test a model that could potentially increase uptake of government datasets by creating technology based applications, services and platforms. Code4Kenya was also created to accelerate the awareness and ability of the public to make sense of data and to promote engagement around critical public issues. The program was a private sector consortium initiative with funding support from the World Bank and the Africa Media Initiative. Other partners included the Kenya ICT Authority (formerly, the ICT Board)[6] (a government agency), the Open Institute (an open data think tank), Strathmore University and iHub (a technology innovation hub).

Skilled data technologists were embedded within three media houses (the Star, The Standard, Nation Media Group) and a civil society organization (Twaweza) to collaboratively build local relevant tools and applications that would increase consumption of data on the open data platform (Mutuku, Colaco and Omenya 2013). The developers relied on the host organizations' knowledge of key thematic issues - health, education, county administration and election coverage - affecting grassroots citizens, to identify problems statements that could be addressed using open data tools.

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1 Kenya Open Data Initiative https://opendata.go.ke
2 ibid
3 Open Government Principles https://public.resource.org/8_principles.html
4 Code4Kenya http://code4kenya.org/
5 A Pre-incubator here is defined as an experiment used to test an operational incubation model before it is implemented in a formally established open data technology incubator.
6 Additional Details of consortium partners and their roles are included in the Appendix

More specifically, Code4Kenya aimed to develop applications that would create demand for government data and in the process, catalyze institutional change as well as how the citizens engage with the government. Moreover, Code4Kenya aimed to develop capacity in data journalism within organizations working with grassroots communities. These could then implement their own data projects that could increase access to government information within these communities. The Code4Kenya applications built were launched to the general public early 2013 at a press conference. This provided an opportunity for research to study the implementation of these projects, monitor how they were deployed for use and establish an evaluation process of emerging impacts.

The following section provides a brief overview of the Code4Kenya applications developed[7]

THE CODE4KENYA TOOLS DEVELOPED

County Safety

Host Organization: The Standard Group

The County Safety Crime Visualization is an intensity map of all crimes reported in selected local dailies, including The Standard, from January to August 2012. The crimes are listed in 15 categories and are documented by where the crimes occurred (Source: Code4Kenya).

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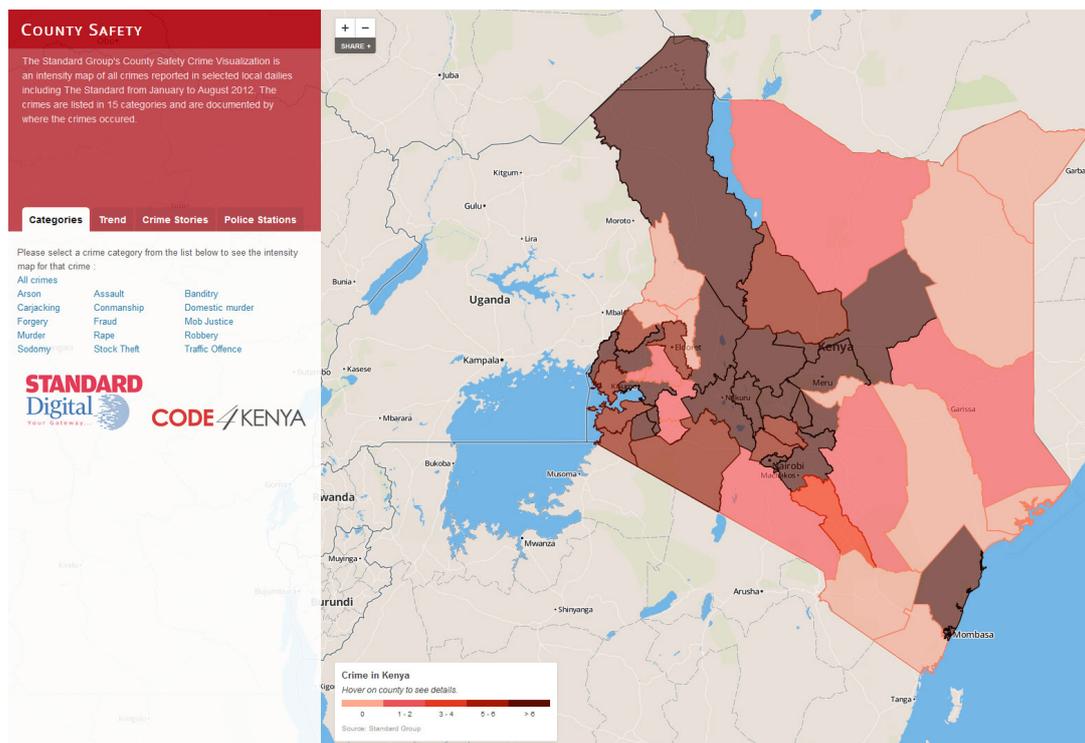
7 Descriptions provided by Code4Kenya

Find My School

Host Organization: Twaweza

FindMySchool provides visitors with information on how individual schools in Kenya perform in national examinations. The underlying data is presented in a simplified way and visualized to for easy understanding and sharing. (Source: Code4Kenya)

Data Story

Host Organization: Nation Media Group

Datastory is a tool designed to allow journalists and those working at the data desks in media organizations to publish visualizations. With a heavy emphasis on geographical visualizations, the content published from the platform can be used online and in print. (Source: Code4Kenya)
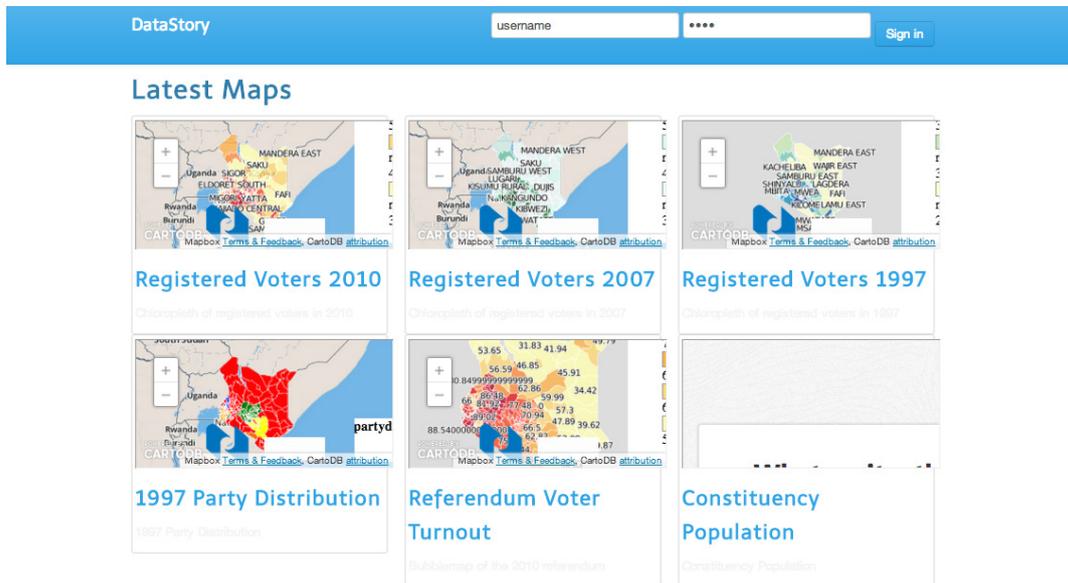
Star Health

Host Organization: The Star newspaper

Star Health is a dashboard that presents health sector related data through visualizations and various widgets. It works for the journalists as well as the general public. In addition to widgets that curate various datasets, the dashboard aggregates health related story from the The Star newspaper website.
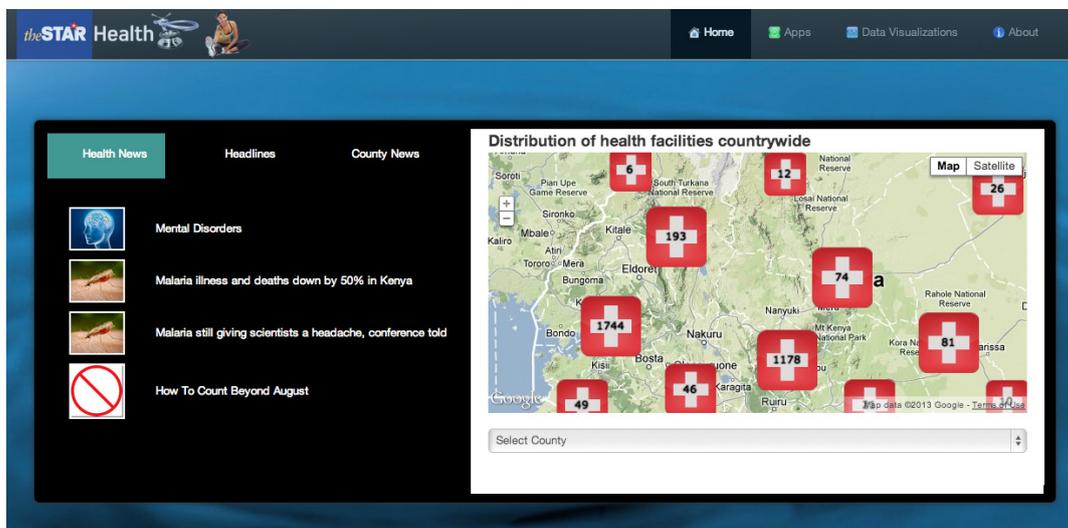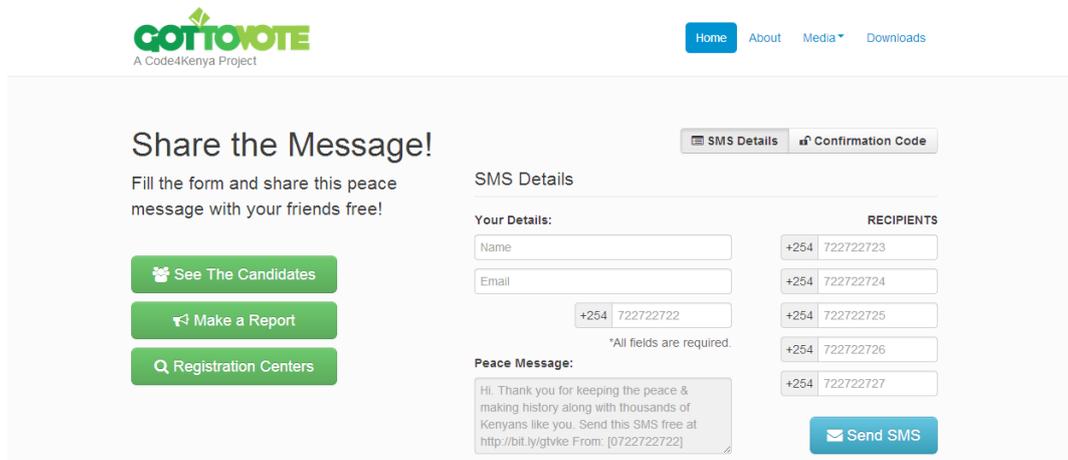
GotToVote

GotToVote! was built as a Code4Kenya data journalism project to demonstrate how data-driven tools can help ordinary citizens decipher and then act on the news they read / watch, by finding out how a national event such as the elections affects their personal lives or local communities. This tool has since been used in other countries including Zimbabwe and Malawi.
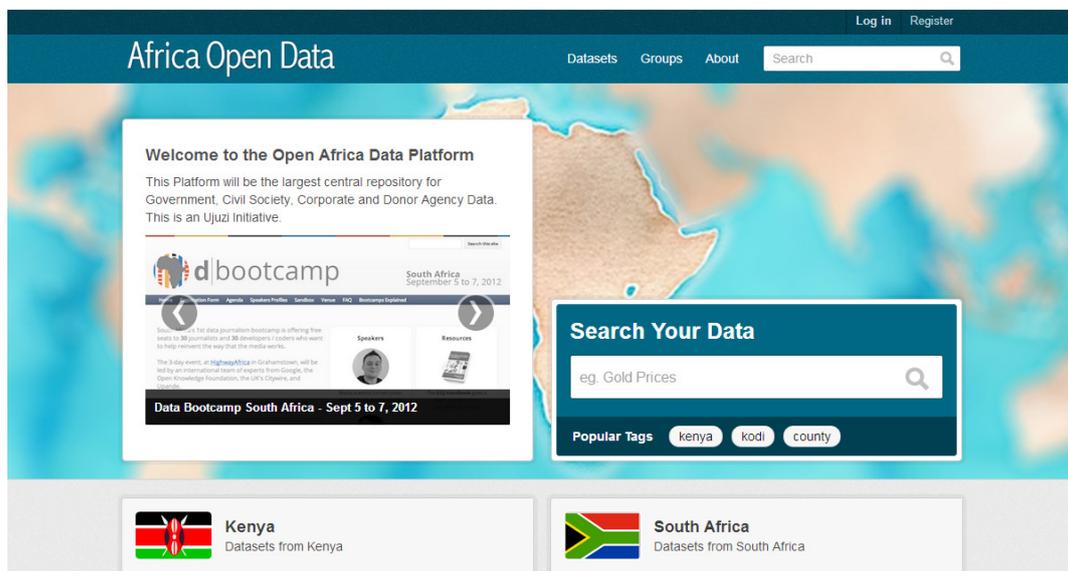
Africa Open Data

Africa Open Data is an open data portal and data repository for data across Africa.

(Descriptions provided by Code4Kenya)

RESEARCH PROBLEM STATEMENT

Current research around local open data initiatives in developing regions, where the concept is relatively new, is mainly focused on a country's readiness to adopt open government and the journey towards setting up these initiatives. However, there is limited systematic documentation on the sustainability of these initiatives, initial impacts that these initiatives have had on increasing citizens' access to information, or how open data has helped promote transparency and improved service delivery.

Since the launch of the Kenya Open Data Initiative three years ago in July 2011, access to and utilization of open datasets by the population has still remained low, despite availability on the main portal (opendata.go.ke). There have also been community applications built using this data available on the platform, pulling data from the portal and presenting it in a more simplified way for use by the population. Despite these initiatives, there has been little documented evidence of consequential increase in use of open data from the platform or the resulting impact of these initiatives and technologies on the way citizens engage with government information. The impact of the six-month Code4Kenya pre-incubator initiative is also yet to be documented.

Thus, through a research study, iHub Research aimed to follow the post-implementation process of these technology intermediary interventions to evaluate their progress and success in promoting access to information and citizen engagement with government data. The underlying hypothesis is that improved access to information empowers grassroots citizens to hold their governments accountable and demand for improved service delivery on the basis of this information. However, majority of the grassroots communities are not in a position to make sense of open data in the government portal as it is (Mutuku and Colaco 2012). Intermediary technology tools such as open data applications aggregate and synthesize this data to produce useful content in a manner that can be easily assimilated and utilized by the community thus improving access to government data and information.

BACKGROUND OF PROJECT -
OPEN DATA IN DEVELOPING COUNTRIES (ODDC)

iHub Research conducted a research study between May 2013 and March 2014 to understand the emerging impacts of open data applications and technologies, in promoting access to information in developing countries. The study, dubbed "Understanding the Impacts of Code4Kenya Open Data Applications and Services," is part of a two-year research program named 'Exploring the Emerging Impacts of Open Data in

Developing Countries' or in short, Open Data in Developing Countries' (ODDC[8]). The research program is coordinated by the World Wide Web Foundation, and funded by grant 107075 from the International Development Research Center (IDRC[9]), Canada.

The project is part of 17 independent case studies conducted in 14 countries, with iHub Research focusing on the emerging impacts of open data technology intermediaries in Kenya. For this project, iHub Research assessed the state of several open data intermediaries in Kenya, such as the national Kenya Open Data Initiative (KODI)[10], and other independently managed open data initiatives, including the Code4Kenya initiative. The main goal of this project was to understand the intended long-term impact of these initiatives and document evidence of the extent to which they achieved a stated goal of drastically increasing the usage of open data in the country.

RESEARCH OBJECTIVES

The main objective of this research was to monitor and assess the impact of technology open data intermediary interventions in promoting and facilitating the grassroots utilization of open data, thus promoting different governance structures within the sectors of water, health, and education. The research aimed to explore the extent to which these open data applications affect access to and use of government information to improve accountability and service delivery within these sectors. Specifically, the research aimed to study the following key elements:

1   How intermediary open data applications affect the awareness of the availability and
        potential value of open data among citizens.
2   How intermediary open data applications are deployed to increase consumption and use of
        open data;
3   How intermediary open data applications impact citizens and improve governance.

To meet these objectives we aimed to answer questions such as:

1   What is the level of awareness of open data among citizens in grassroots communities?
2   How did these citizens come to know about open data and related initiatives?
3   Who is using open data tools and what are the characteristics of the people using open data?
4   What prevents citizens from accessing and using open data and open data applications?
5   Has access to open data improved the social welfare of citizens and how public institutions
        offer services?

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8   The Emerging Impacts of Open Data in Developing Countries http://www.opendataresearch.org/emergingimpacts
9   International Development Research Center http://www.idrc.ca/EN/Pages/default.aspx
10 The Kenya Open Data Initiative Portal http://opendata.go.ke/

Through this research, we further aimed to provide evidence of impact that provides a good business case for entrepreneurs, companies and government that may wish to explore open data further. Moreover, we anticipate that if empirical evidence of open data achieving some of its stated objectives[11] is documented, this will provide a basis for governments and local organizations to proactively sustain the existing platforms. Further, through this research we would like to contribute to the development and testing of common methods of assessing context, strengths and weaknesses of open data initiatives over time.

METHODOLOGY

In order to effectively conduct this study, we used the following mixed methods approaches to achieve our objectives. The methodology drew largely from the suggested ODDC network-level research framework and tools.[12]

LITERATURE REVIEW

A preliminary literature review was conducted to study the current state of open data supply and use in Kenya. This review, looked at published articles and papers written on case studies of open data in Kenya as well as other developing regions. Through this review we aimed to study the extent to which open data informs local stakeholders and its impact on influencing governance structures. An analysis of the literature review also encompassed a contextual assessment of the political, legal, technical and social contexts in which the Open Data Movement in Kenya operates and other macro factors that may promote or hinder the success of such an initiative.

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11 Vision for Kenya Open Data https://opendata.go.ke/page/about
12 ODDC Methods http://www.opendataresearch.org/emergingimpacts/methods

EXPLORATORY FIELD STUDY

An exploratory survey was carried out to understand the community's awareness of the Kenya Open Data Initiative in Kenya, and any of the applications resulting from the Code4Kenya initiative. In particular, this study aimed to qualify the perceived usage and penetration of these apps in different communities in Kenya as a first step towards understanding the role that technology intermediaries play in facilitating impacts from open data.

Data collection was primarily collected using questionnaires.[13] We used two sets of questionnaires in this survey targeting respondents who may have heard about open data before, and those who had never heard of open data. A pre-test was conducted for two days within different locations in Nairobi. The main fieldwork was carried out in three main towns - Nairobi, Meru and Nakuru:

- Nairobi - Nairobi Central Business District, Kasarani and Zimmerman suburbs, Mathare and Pipeline slums.
- Meru - Town Center, Makutano area, Kenya Methodist University campus.
- Nakuru- Town Center, Langa Langa, London Estate, Jomo Kenyatta University and Ministry of Agriculture and Fisheries areas.

Figure 1: *Nairobi Fieldwork Map*

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13 See appendix

Figure 2: *Meru Fieldwork Map*
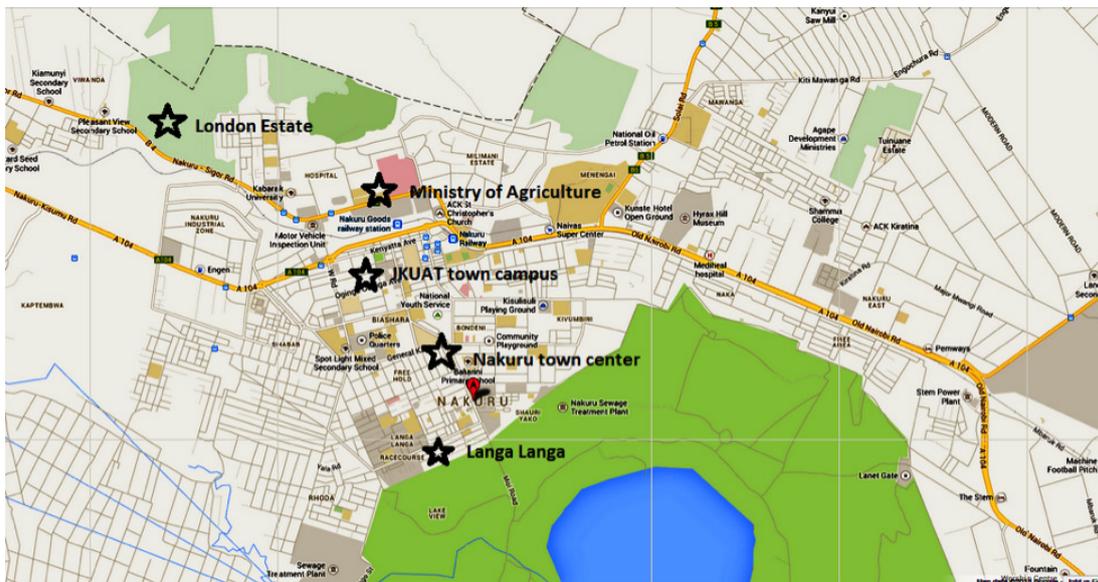
Figure 3: *Nakuru Fieldwork Map*

In this survey, we had 71 respondents (66% male and 34% female) from different socio-economical classes both in rural and urban communities neighboring these towns. We did not aim to be representative and were more interested in collecting qualitative insights on emerging impacts open data.[14] We intended to reach respondents who had at least an access point to Internet (mobile phone, laptop, cyber café etc.) as the open data applications we were studying are all on an online platform.

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14   *Additional demographic information is provided in the appendix*
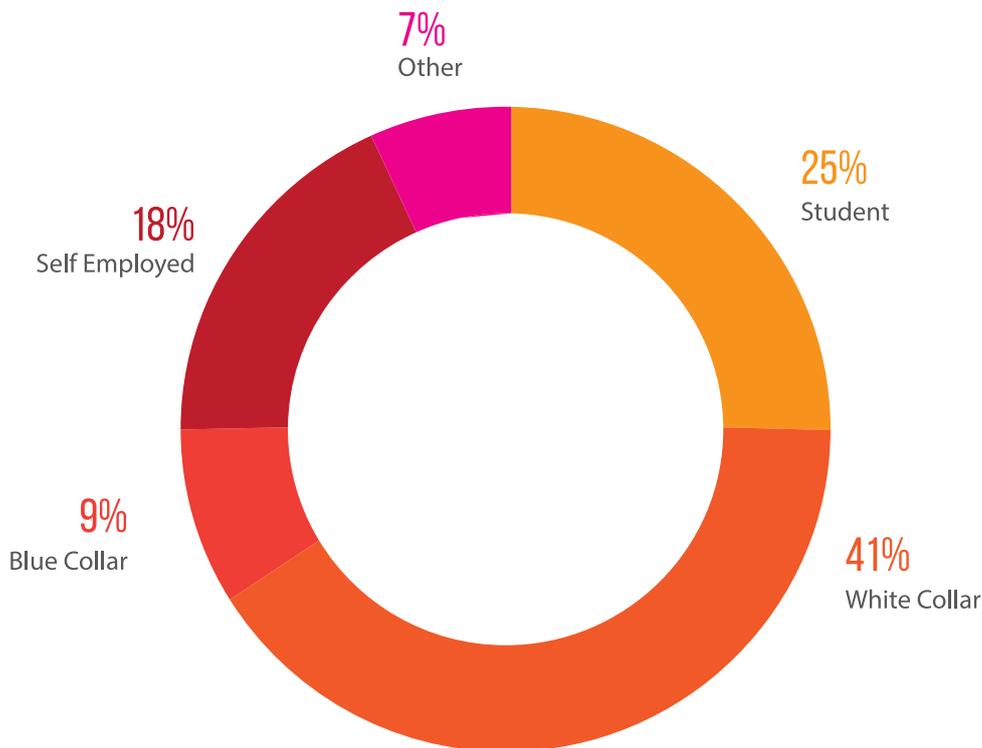
OCCUPATION

Figure 4: Occupation of Respondents (n=71)

We anticipated recruiting, introducing and training on the use of the Code4Kenya applications the respondents in these communities who had not had any prior awareness or interaction with the open data platforms or applications. However, Code4Kenya applications were never officially launched from beta mode and thus were not supported as discussed further in the report. We found it difficult to do an impact assessment on applications that are not in public use or support and thus did not deploy these applications or conduct a follow up study to understand their usage.

STAKEHOLDER INTERVIEWS

We conducted in-depth interviews with stakeholders identified as part of the local open data ecosystem in a bid to understand their current efforts in building, using and maintaining open data technologies.[15] This included interviews with stakeholders of the Code4Kenya project, independent developers using open data, government officials and civil society actors. These interviews were led using discussion guides with an aim of understanding the perceived roles of each of these actors as well as the successes and challenges experienced in providing intermediary open data services, supplying or using open data.

15   See appendix II for list of participants in the IDIs

APPLICATION DASHBOARD ANALYSIS

With this approach we intended to quantify the initial usage patterns on the open data platform, selected Code4Kenya and independent community apps. This involved an analysis of statistics derived from application dashboards through a process known as web analytics. Web Analytics is the process of measuring web traffic on websites as well as providing metrics on how effective your website is. It is critical to understand who is using the data and what content is useful to them on the website. We studied the following different open data platforms:

- The Star Health, County Safety and Find My School built under the Code4Kenya program;
- Ufahamu, hosii, sekoo and primo[16], health and education platforms built by independent application developers and;
- The main Kenya Open Data platform.

We also did a comparison analysis with dashboard data from the proprietary Kenya School Report, which uses survey-based data and closed data to provide information on education facilities. Each of these applications are on an online platform and accessible from a web browser.

Through web analytics, we aimed to study the actual usage of the platforms and using the results obtained to infer the overall penetration of the applications. We also monitored the application dashboards throughout the research in order to infer overall change in usage of these applications over time and consequently, any impact of the content provided by these platforms. During our initial in-depth interview discussions, we explicitly requested access to the back-end of Code4Kenya applications in order to understand the demographics of the application users as well as their behavior when accessing the site. Similarly we were able to obtain statistics of the usage of two independent open data applications and the main Kenya Open Data Portal in 2013. For this particular analysis, we tracked sessions over time on the websites through:

- Number and demographics of visitors – unique and return visitors;
- Number of page views and duration of time spent on each page;
- Bounce rates – only going to the home page and leaving without opening other pages on the site;
- Browsers used to access the applications.

Collectively, by cross analyzing these results with the qualitative interviews, we were able to discover trends and draw a picture of activity patterns on each of the websites tracked. The dynamics of the traffic to each site would provide a rudimentary insight into who is accessing the content on the web on which content is most popular (has most 'impact').

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16   http://geospatialsynthesis.com/prod.php

USER EXPERIENCE STUDY

Three sample applications and platforms (the Kenya Open Data Portal, Find My School and Kenya School Report)[17] were selected for a usability evaluation to understand the functionality and the potential of utilization of the open data platforms. This experimental approach was used as an alternative to an end line survey, where respondents were exposed to these platforms and their experience using each of these documented. These applications, which were education-focused, were selected based on a preliminary analysis of the survey data. Open data available on the education indicators in use by these applications was most closely related to the desired information of most of the respondents in the exploratory survey.[18] The three sample platforms had location-based (geo-tagged data) open data on schools as the common underlying base information. The applications were community-facing solutions, meaning that the application can be used by grassroots level citizens, not just by the high-level policy makers and organizations.

Each of these web-based applications was tested in our user experience lab where different scenarios of use were simulated and respondents asked to perform specific tasks. At least one of these tasks was the same for each platform under study and this was useful for comparative analysis on the use of the open data technologies. A sample of nine respondents participated in this user experience study through one-on-one interviews, modified think aloud experiments and general testing of the web tools. This sample represented potential end-users of the open data platforms. These respondents were aged between 24 and 40 who had used a computer with Internet before. These included parents, students, teachers and general citizens who may have an interest in education information. Qualitative data collected during the research was analyzed and contributed to the overall analysis of the role of technology intermediaries.

17   Kenya School Report http://www.kenyaschoolreport.com/
18   Additional information regarding the sampling and selection included in the appendix

THE CONTEXTUAL FRAMEWORK OF THE KENYAN OPEN DATA ECOSYSTEM

The push for open data has been driven by different factors, incentives and influences. In developed countries, economic benefits of available data seem to be more prominent in driving open data initiatives. In developing countries, advocates base their core reasons on transparency and good governance. Open data programs in developing countries initiated by governments and civil societies are hailed as encouraging citizen engagement and promoting access to information. In Kenya, objectives of the open data initiatives also included innovation and information-based policy in addition to transparency (Sika 2013, Schwegmann 2013).

Apart from the reasons mentioned above, other factors influence the success or failure of open data initiatives - political pressure either from civil society, media, businesses or opposition sometimes drive the launch of these initiatives. Most of these open data programs in developing regions are funded by international donors, creating an avenue for governments to receive additional resources. Open data initiatives have been viewed as great PR for most governments, but those that do it for this reason usually have low quality data, as their intentions do not align with the essence of what open data is and should do (Schwegmann 2013).

The successful launch and use of data from these platforms depend on the various climates in the country at the time. Kenya is one of the few African countries to host an open data platform, a feat that has earned the country a great reputation internationally. The launch of the Kenya Open Data Initiative was no different and mainly influenced by the political climate, current events, sector interests and other key players. We discuss in this section the contextual framework in which open data initiatives exist in Kenya including political, historical, legal, technical, economic, social and organizational contexts.

POLITICAL AND HISTORICAL CONTEXT

Political will is a key driver in incentivizing open data initiatives. In Kenya, government institutions are charged with collecting and storing data that relates to their mandates. Unfortunately, due to policies and ingrained practices of the colonial and early Kenyan governments, most of this information was 'siloed' within the respective institution and was rarely shared, even with other government institutions. Corrupt networks in public institutions benefited greatly from this culture of monopolizing access to information, and used this power to advance their personal interest, usually at the expense of the citizens. Access to this information was extremely difficult and in some cases impossible. These corrupt networks put up a spirited fight against any and all attempts to release data that would have made them accountable (Schwegmann 2013, Kwamboka 2013, Majeed 2012). Civil society had been advocating since the turn of the century to have data held in government ministries availed to the public.

These efforts were continuously met with resistance mostly due to vested interests, up until Dr. Bitange Ndemo's appointment as the Permanent Secretary of the Ministry of Information and Communications. His role was vital in promoting an open data ecosystem as he spearheaded the initiative to avail data in an open platform. He and a volunteer task force made up of computer programmers, data experts and World Bank officials, worked together to launch Kenya's first successful open data platform in July of 2011 (Majeed 2012). The KODI initiative was not the first attempt at releasing government-held data though. Ndemo, who joined the then President Kibaki's government in 2005, was able to successfully map distributions of Constituency Development Funds (CDF) and by doing this, exposed the unfair allocation of funds. The initiative ran into intense political resistance from Members of Parliament as it exposed the allocation of funds to vote rich areas at the expense of deserving marginalized areas. In order to protect their interests, politicians lobbied to the minister at that time and the initiative was eventually terminated.

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In 2010, due to pressure from the private sector (businesses and the technology community), the ICT board launched a government website that also aimed to equip the public with crucial government held data.

However, the board had no access to information leading to lack of content on the site, and before the year ended, the site was taken down. The failure of these early attempts were attributed to lack of well established relationships with the various ministries and institutions that held this data, as well as lack of political will (Majeed 2012, Kwamboka 2013).

At this time, pressure to increase transparency from different sectors, more notably the civil society, was piling up. In 2011, Mzalendo, a civil society initiative that aimed to increase public participation, advocated for release of financial data to allow citizen scrutiny of the management of public resources. This provided a great opportunity for the development of an open data initiative. Ndemo and the then Minister of Information and communication, Mutahi Kagwe, had a good working relationship and were fortunate to have the president's ear. Buy-in from the very top of political power created a favorable environment to persuade government institutions to release their data, allowing for launch of the Kenya Open Data Initiative (Majeed 2012).

Unfortunately, the momentum built during this time wore off as the political landscape changed. The shift from a centralized system of government to devolved units (in response to schedules stipulated in the constitution promulgated in 2010) significantly changed the roles of national government officials especially those working in ministries whose functions were to be devolved to county governments. The transition period into a devolved government system is still taking effect today brings with it many challenges, and sometimes hinders effective adoption of open data.

Before, during and after the 2013 elections, little attention was paid to the open data platform and the excitement seen around its launch quickly faded. The current president, Uhuru Kenyatta, has however, shown some interest in opening up government, reigniting hope in the revival of the initiative (Brown 2013). The government, through their Jubilee party manifesto, pledged to increase transparency in government as well as promote information sharing within public institutions. Citizens have expectations for an effective government as the president promised to digitalize government, "by cleaning up and managing databases that will be stored in a secure and centralized location and which can be accessed and used by all ministries and branches of Government...to make Government more efficient" (Jubilee Coalition 2012).

In reference to the Kenya Open Data Initiative, the government also pledged to provide more information on population, voting, taxation and health. Recently, the Ministry of Information, Communications and Technology invited iHub to contribute to its Draft National Public Communication Policy, a document that strived to not only avail more information to the public, but also improve information sharing within the different government institutions and ministries (Personal Communication, Ministry of ICT, 2013).

KENYA OPEN DATA TIMELINE

2004

2005

2006

2007

2008

2009

2010

Bitange Ndemo's appointment as Permanent Secretary

Bitange Ndemo's appointment as the Permanent Secretary of the Ministry of Information and Communications

CDF distribution Map

Map showing distributions of Constituency Development Funds (CDF) was launched but eventually taken down due to political pressure

Central Bureau of statistics

Central Bureau of statistics decommissioned and replaced with Kenya National Bureau of Statistics

ICT Board

The set up of the semiautonomous agency that was mandated to implement policies and projects drafted by the then ICT ministry.

SEACOM undersea Cable Lands

The first cable, SEACOM, lands in Mombasa and goes live

TEAMS undersea Cable Lands

The second undersea cable, SEACOM, is launched in Mombasa

Kenya's New Constitution

Kenya Promulgated a new Constitution which gave citizens the right to information.

EASSY Undersea cable Lands in Kenya

The third undersea cable, EASSy, lands in Mombasa.

Government Website Launched

ICT board launched a government website aimed at equipping the public with crucial government held data. lack of content on the site led to its closure before the year ended.

2010

2011

2012

2013

2014

2015

Morocco 's Open Data Platform Launched

Morocco becomes the first Country in Africa Io launch an open data platform

Kenya Open Data Platform Launch

The Kenya Open Data platform was launched by then President Mwai Kibaki

LION2 undersea cable goes live

The fourth cable, LION2, lands in Mombasa and goes live

Code4Kenya

A pre-incubator initiative that was launched and run from July to November 2012, in a bid to test a model that could potentially increase uptake of government datasets by creating apps, services and platforms.

President Uhuru Kenyatta Elected

President Uhuru Kenyatta wins the Kenya 2013 Elections. He promises an open government where information is easily accessible.

Open Data Day Kenya

Open Data Day is a gathering of citizens in cities around the world to write applications, liberate data, create visualizations and publish analyses using open public data to show support for and encourage the adoption open data policies by the world's local, regional and national governments. The Event tool Place in Nairobi, Mombasa and Kisumu.

LEGAL CONTEXT

Policy played a significant role is shaping how government handled data and contributed to the establishment of a culture of hoarding government information. The Official Secrets Act, a legal provision possible within the old constitution, gave government the right to withhold data from the public. Under the colonial government and later under president Daniel Arap Moi, this policy was in effect and therefore gave government officials the freedom to resist and even turn down requests for data. In a past interview, Davis Adieno, former national coordinator at the National Taxpayers Association, described the attitude most government officials had in regards to information sharing, "Under the Moi regime, the government was clearly on one side the citizen on the other. Citizens had no business to access (government) information" (Majeed 2012).

The new constitution, promulgated in 2010 under the coalition government, contradicted the Secrets Act, as it required public institutions to allow access to information that they held. Article 35, section 1 to 3 of this new constitution explicitly gives citizens the right to access public information; "Every citizen has the right of access to information held by the state...The state shall publish and publicize any important information affecting the nation" (Majeed 2012, Kwamboka 2013).

However, three years after the open data platform's launch, the initiative still faces a major barrier; public institutions refused to post their information while claiming ownership. While access to information may be enshrined in the bill of rights it is not institutionalized in law. The current legal framework does not explicitly define what information citizens can access, how public institutions can avail data to the public, or the consequences to be faced for their violation or failure to comply. A draft bill is still pending in parliament but the need for an Access to Information Law to action the above constitutional right is necessary to adequately support the National Kenya Open Data Initiative (Wokabi 2012, Kwamboka 2013).

TECHNICAL CONTEXT

The ICT sector in Kenya is stated as one of the most advanced in the continent. There are currently more than 31 million active mobile phone subscriptions; 49.7% of the general population has access to an Internet connection. Despite most people accessing Internet via mobile phones, fixed fiber subscriptions has grown by 86.8% from 2012 to 2013 (Communications Commision of Kenya 2014). In its annual report dubbed 'Measuring the Information Society 2012,[19] the International Telecommunications Union (ITU) ranked Kenya as one of the leading countries in the developing world to take a 'lion's share' in mobile growth (International Telecommunicatin Union (ITU) 2012).

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19 http://www.itu.int/ITU-D/ict/publications/idi/

The country now has four main undersea fiber optic cables: The East Africa Marine System (TEAMS), SEACOM, Eastern Africa Submarine Cables Systems (EASSy) and Lower Indian Ocean Network (Lion2). These infrastructure development structures have led to significant competition, leading to lower prices of data and communication. Telecommunication companies now see data as the future main revenue generator (Nyabiage 2013).

These numbers place Kenya in a relatively good position to disseminate open data via online resources. However, this has not been the case, as feature phones still dominate the Kenyan Market, with smart phones accounting for only 30% of urban phones. This means that most mobile devices are not optimized for the maximum use of the open data platform and applications built out of it (Manyika, et al. 2013). The public sector is also yet to join the digital revolution; most government institutions and even the Kenya National Bureau of Statistics (KNBS) have paper based data collection, storage and dissemination systems. This established system makes it extremely difficult to easily share in open formats the information and is mainly due to lack of funding, personnel and most importantly, goodwill. To solve this issue, digitization of content held by government was launched recently and priority given to Judiciary and Lands ministries, health and police records (Kwamboka 2013, Wokabi 2012).

The Kenyan government chose to launch an open data portal on the Socrata platform,[20] an America-based cloud software company that focuses exclusively on democratizing access to open data. The platform was availed on a commercial contract basis between the Kenyan Government and Socrata (Kwamboka 2013). According to the Kenya ICT Board, the decision to use the Socrata portal was reached due to time constraints, and building a platform from scratch would consume a lot of time (K. Kobia, personal communication, April 11, 2011).[21]

ECONOMIC CONTEXT

Kenya has been experiencing fairly slow economic growth from 2011 to 2013. In 2011, the same year that the country was launching the Open Data Initiative, Kenya's economy recorded a 4.4% growth, and 4.5% in 2012 (African Development Bank 2013). The slow growth was attributed to both the International Criminal Court (ICC) cases against six prominent Kenyans, and the preparation for the general elections that took place in March 2013. Despite this slow progress, the information, communications and technology sector in Kenya has seen impressive growth in recent years- a steady growth of 20% annually since 2000 and a contribution of at least 1% to the GDP. This economic growth has catalyzed the advance of a multibillion-telecommunication industry. Digital financial products such as mobile money had 24.8 million subscriptions as of June 2013.

20 Socrata Platform http://www.socrata.com/company-info/
21 Kaburo Tells the Story of the Kenya Open Data Initiative http://vimeo.com/40158452

20   Socrata Platform http://www.socrata.com/company-info/
21   Kaburo Tells the Story of the Kenya Open Data Initiative http://vimeo.com/40158452

Other social enterprises build technology based applications such as Ushahidi,[22] a platform that uses crowdsourcing to identify and report emergency situations, was launched locally and has since been used worldwide. According to the technology community, access to data spurs growth in ICT related businesses as well as increased efficiency in business processes (Majeed 2012, Communications Commision of Kenya 2014).

Despite growth in this sector, the World Bank states that Kenya is still underperforming as compared to its peers, all who have not launched open data initiatives (The World Bank 2009). For this reason, recommendations for the current government administration include focus on: social equity, quality education and better management of water resources to improve economic standards. The Bank also advises the Kenyan government to strengthen institutional reforms in devolution, judicial transformation and public financial management. The role of ICT in the economic development in Kenya has been a key priority moving forward and is part of the country's economic stimulus plan, Vision 2030. Access to data is extremely vital in catalyzing and sustaining the sectors and overall economic growth.

SOCIAL CONTEXT

Kenya is a diverse country made up of over 40 million people belonging to more than 40 different ethnic groups. According to the World Bank, this mostly youthful country has a fairly impressive education rate but poverty levels are still high, with a little less than half living below the poverty line (The World Bank 2009). Kenya however, still grapples with high inequality and corruption levels and the need for effective service delivery is paramount in promoting development and citizen empowerment. Classified as a low income country, according to World Bank's country classification,[23] the country continues to be faced with major social challenges including; poverty, insecurity and food shortages. International bodies like the United Nations, The World Bank, in partnership with the Kenyan government, have been working on initiatives to help alleviate some of these social challenges through projects distributed in various sections of the social economy. The World Bank was also an important partner in Kenya's quest to have an open data portal, by contributing towards funding the project.

Despite these efforts, other governing challenges exist. Most ministries responsible for service delivery have been working in isolation and are ignorant of projects other ministries are undertaking. This lack of synergy occasionally leads to contradicting programs and policies that promote waste of resources and duplication within the public sector. Citizens have become accustomed to missing, inadequate, and sometimes, inaccurate data from the government lead to lack to trust in public institutions. Citizens' attitude to government projects can lead to failure of these initiatives despite the noble motivations (Kwamboka, 2013).

22   Ushahidi http://www.ushahidi.com/
23   World Bank country Classification http://data.worldbank.org/about/country-classifications/country-and-lending-groups

ORGANIZATIONAL CONTEXT

Necessary structures were needed for the successful launch of the Kenya Open Data Initiative. In 2006, parliament passed a bill that decommissioned the Central Bureau of statistics and replaced it with the Kenya National Bureau of Statistics (KNBS), the agency mandated to handle all government data including publication and dissemination. However, most of this data held by KNBS is either in paper form and if online, data available cannot be manipulated easily. This was also due to the fact that the agency relied on selling its reports to recover costs of collection and publication of data (Majeed, 2012). In 2007, another institution, the ICT board was set up as a state corporation under the State Corporations Act in 2007. The semiautonomous agency was mandated to advice and implement ICT policies and projects drafted by the ministry of Information and Communications. The ICT Board was the initial custodian of the national open data initiative in partnership with the Kenya National Bureau of Statistics, the World Bank and the US software company, Socrata. The institution has since been merged with other technology agencies within government to form the Kenya ICT Authority.

In order to quickly launch the open data platform, a team drawn from various organizations and with different relevant skills was assembled to form the open data task force. This team was instrumental in launching Kenya Open Data Initiative, which included the opendata.go.ke portal (Brown 2013, Majeed 2012). Similarly, other private institutions have since come together to form initiatives such as Code4Kenya. Below is a summary of various instrumental players and the roles they played in launching the platform and the Code4Kenya initiative.

STAKEHOLDER	ROLE	NOTES
World Bank Institute (WBI)	Funder and Facilitator	Provided financial support, skills and knowledge support.
The Kenya ICT Board	Management	Initiated the KODI project and provided project management and oversight over the consortium of partners.
African Media Initiative (AMI)	Partner	Co-funded the Code4Kenya incubation program
Open Institute Open	Implementing Agent	Instrumental in project managing the fellowship program within the initiative
Strathmore University - @iLabAfrica	Stakeholder	Provided academic mentorship and support for the Code4Kenya incubation program
iHub Research	Research Partner	Provided M&E and research documentation for the initiative and other related projects

Code4Kenya organizational structure *(Kwamboka 2013, Mutuku, Colaco and Omenya 2013)*

THE SUPPLY OF OPEN DATA IN KENYA

In this section we examine the current state of open data with regards to the supply side of open data in Kenya. This analysis is based on key informant interviews with the stakeholders within the open data ecosystem, including open data technologists and host organizations in the Code4Kenya fellowship.

The Kenya Open data portal explicitly states under its terms of references that it is the responsibility of all government Ministries, Departments/Agencies to release information in their possession deemed as 'open data' in accordance to Article 35 of the Kenya Constitution (2010) that guarantees the citizens a right to information. This has however been a challenge as most government ministries and agencies are yet to fully embrace the directive leading to most of the information available on the platform remaining out of date. In fact, over the past year and a half, since December of 2012, fewer than 10 new datasets have been uploaded or updated constraining regular supply of open data through the national portal in 2013, based on website analytics.

This challenge may be due to an unclear distinction of what information can be safely shared with the public and what information is considered classified; technical capacity to periodically produce open data and; an understanding of the exact mandate for these institutions to release data as enshrined in law. For this reason, legal frameworks including policy documentation with implementation plans and an access to information law are necessary. However, citizens can still individually demand for public information held by the government on the basis of Article 35 in the constitution (Georgiadis 2012). The ICT Board that was managing the KODI platform also underwent structural changes. These changes included a merger into a new government agency, the Kenya ICT Authority. Further, there was no open data program manager to run the initiative and this resulted in the few updates of new datasets affecting the supply of open data.

Consequently, privately organized initiatives such as Code4Kenya resorted to scrapping web pages and other information sources to liberate new open data for use within their platforms and applications. However, other independent application users still relied fully on the open data portal for supply of data for their applications for the following reasons. The data on the open data portal is free to use as opposed to secondary sources that may require them to purchase datasets of interest. The datasets are openly licensed on the portal without restricting how it can be reproduced and re-used. Sources of data such as NGOs and public institutions sometimes require formal applications for permits to access the data and restrictions on how it can be used. Finally, the developers mentioned that they tended to trust the data provided by the government, saying that it is much more reliable and verifiable as compared to data from external sources.

Most of the data available on the open data platform however, is not sufficient information on crucial sectors for which the applications were developed. For this reason, developers spent a lot of time obtaining supplementary data from the source ministries, with some of them demanding for licenses or permits in order to produce the data. For instance, The-Star-Health lacked crucial information for its application, including data on the number of registered doctors in Kenya, and the national health insurance scheme, National Hospital Insurance Fund (NHIF)[24] data. To overcome this, Code4Kenya had to directly contact the local Doctors' Union.[25] A future challenge however arises on how to constantly keep this data updated without making individual requests and rely on goodwill each time.

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24   National Hospital Insurance Fund http://www.nhif.or.ke/healthinsurance/
25   The Kenya Medical Practitioners, Pharmacists and Dentists Union (KMPDU) http://www.kmpdu.org/

EARLY IMPACT EVALUATION OF OPEN DATA TECHNOLOGY INTERMEDIARIES

This chapter discusses key findings and results from our research, in particular, how open data intermediaries are facilitating impacts in the lives of grassroots citizens and the sustainability of open data intermediaries to continue realizing these impacts.

CITIZEN RESPONSE TO OPEN DATA

i   Demand For Open Data And Government Information

While there is low awareness of open data among citizens, there exists a high demand for government information, a need that goes unmet.

As mentioned above, one of the objectives of Kenya Open Data was to open up government data to its citizens. We, therefore, wanted to understand how our survey respondents currently interact with the government and how they access government data and information. There was very little knowledge and awareness of open data among respondents interviewed. Only 10% of our respondents had heard of the concept open data and only 7% were aware of the Kenya Open Data Initiative. Two of our respondents who work within government agencies were not aware of KODI.

"Most of our official communication channels are through emails and memos but we they have never received anything on the Kenya Open Data initiative."

–Respondent.

The respondents, who had heard before of open data or the open data portal, mainly stated that they found out about it from mass media such as television and newspapers or a friend. Only one of our respondents had found out about it from the open data website. Our field researchers observed that most surprisingly, several of our respondents were aware of e-government initiatives[26] and tended to confuse it with the Kenya Open Data Portal.

A quick analysis of the different application dashboards indicates general low usage. Analytics of website statistics for the opendata.go.ke portal obtained from the ICTA indicated that in as much as the portal receives a lot of website page visits (approximately 1.1 million unique visits in 2013), actual activity on the portal (including downloading of datasets, manipulation of data into visualizations and other formats) remains quite low. The screenshot below shows variance of page views over time (the number of times a page has been loaded by a user's browser) versus page request/ or activity (the number of requests on a page).[27] More specifically, only 33 new charts and 81 new maps were created (indicating an increase of less than 10% and 35% respectively, of visualizations created on the site since its launch). The spike in activity on the portal could be as a result of increased interest in the implementation of the newly devolved county administration units after the March 2013 national elections. This is evidenced by the fact that the most popular datasets were poverty rates and county urbanization data sets.

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26 Kenya E-government site http://www.e-government.go.ke/
27 Learn About Data Portal Usage From Socrata Site Analytics https://support.socrata.com/hc/en-us/articles/202949968-Learn-about-data-portal-usage-from-Socrata-Site-Analytics

PAGE VIEWS MONTHLY
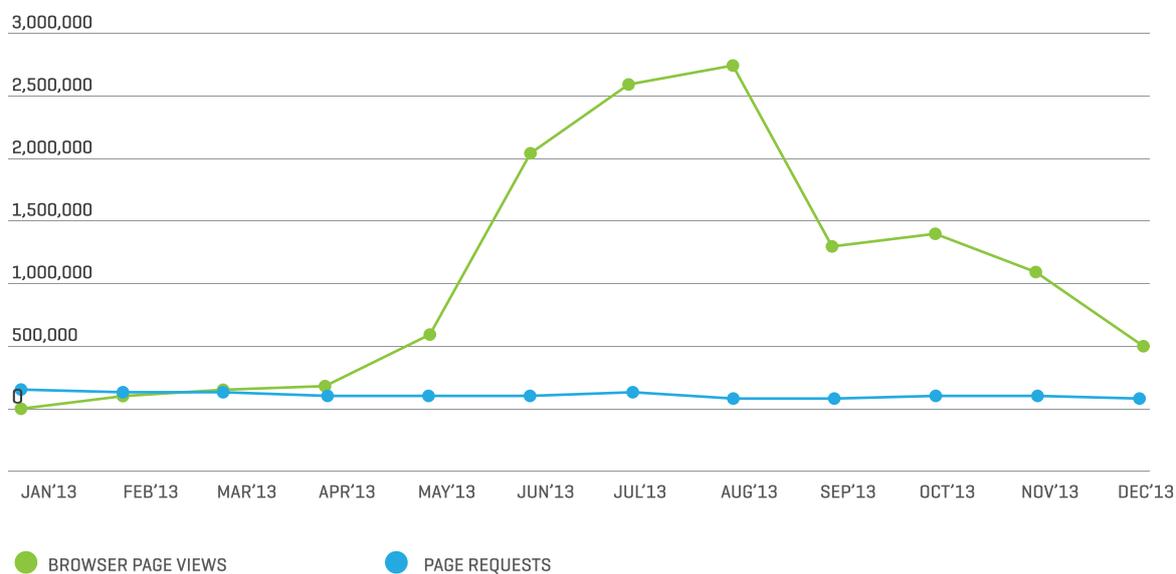
Figure 5: *Site usage of the national open data portal in 2013*

All applications reviewed other than Code4Kenya received less than 5,000 monthly page visits, indicating that they did not have widespread reach given that they target the general population. The general site activity was even lower. For instance, in July 2013, Code4Kenya sites received an average of approximately 3000 daily page views (with a 78% bounce rate i.e. visits to the home page without further interaction in the site) and 1.47 page views per visitor per day with average duration per visit at 1.31 minutes per visitor. Analytics for independent developer sites such as Ufahamu indicated even lower usage per day with approximately one visitor per day.

However, this does not necessarily translate to low demand for this data. 87% of the respondents do receive information from the government. In particular, 62% of these respondents actively seek information on various services from the government including information related to the ministries, their various programs, and the services they offer including the youth fund, census data, security, health services and available trainings.

Political information, government jobs vacancies, information on government tenders and other government procedures were of importance with regards to access to information on government services. Such information could be perceived to be of personal benefit, i.e. employment and other economic opportunities that could improve their lives. Unemployment in Kenya is fairly high with the latest reports placing it at 40%. The government is also one of the largest employers in the country so it was not surprising that information specifically on job opportunities and tender information was of interest to 30% of the respondents.

INFORMATION RECIEVED FROM GOVERNMENT

| Category	Percentage
SCHOLARSHIPS/LOANS	3%
TAX	5%
OTHER	8%
POLITICS	23%
JOBS / TENDERS	30%
GOVERNMENT SERVICES INFORMATION	62%
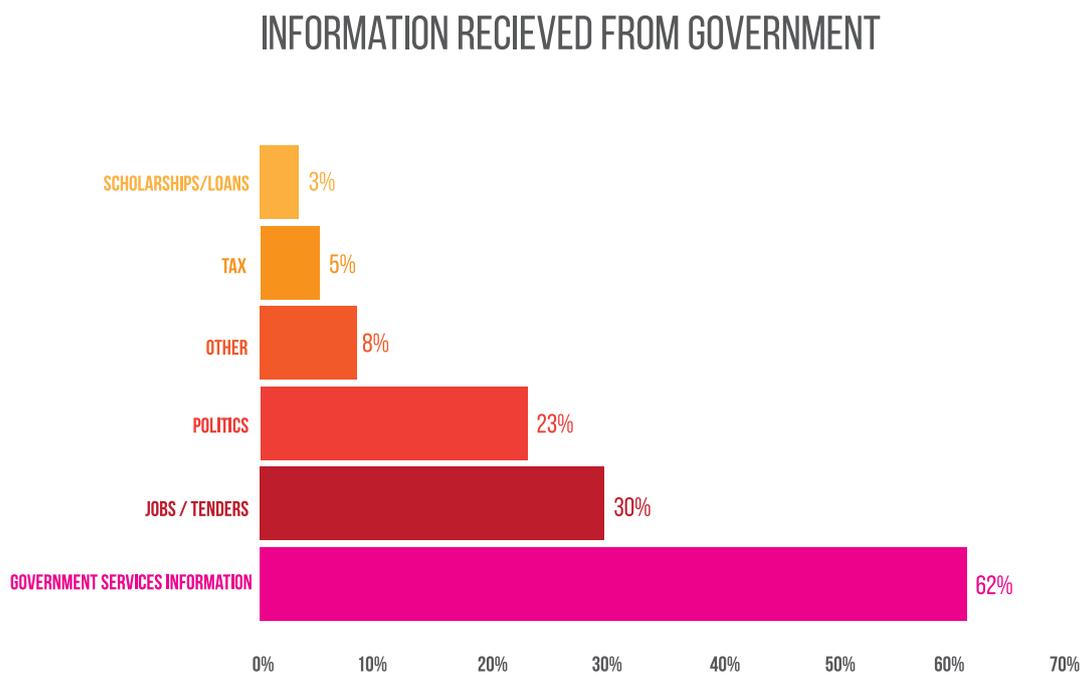
Figure 6: *Information that citizens seek useful from government sources (n=71)*

Generally, there is a high citizen demand for government information on the three thematic areas we focused on in this study – water, health and education. When asked what information and data they wished they could regularly access from government, citizens were mainly interested in information on access to and quality of services provided in public institutions with more than 50% of citizens interviewed stating that they desired to access this kind of information in each sector.

More specifically, 55% of our respondents were interested in accessing data on the availability or supply schedule of water in their areas of residence. This citizens' demand for data has been attributed to major supply issues due to scheduled and irregular water rationing. Other areas where there was a demonstrated demand for data include water quality and safety (42%), water sources (39%) and costs of water services (36%).

WATER INFORMATION DESIRED
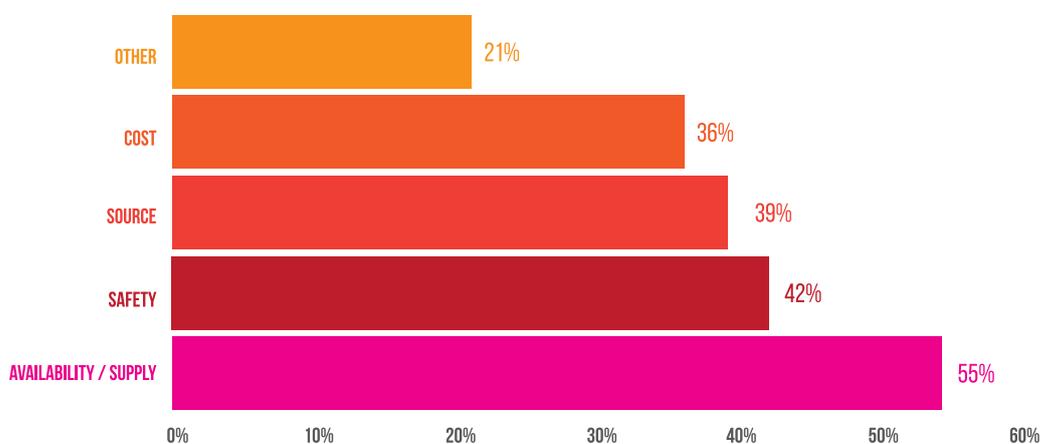
Similarly, 60% of respondents were interested in the availability of health services, including doctors, medicine availability, treatment options, costs if any, and if the facility specialized in a particular field, such as cancer treatments. This is of particular interest as one Code4Kenya application, the Star Health, aimed to address this kind of demand for data.

MEDICAL INFORMATION DESIRED
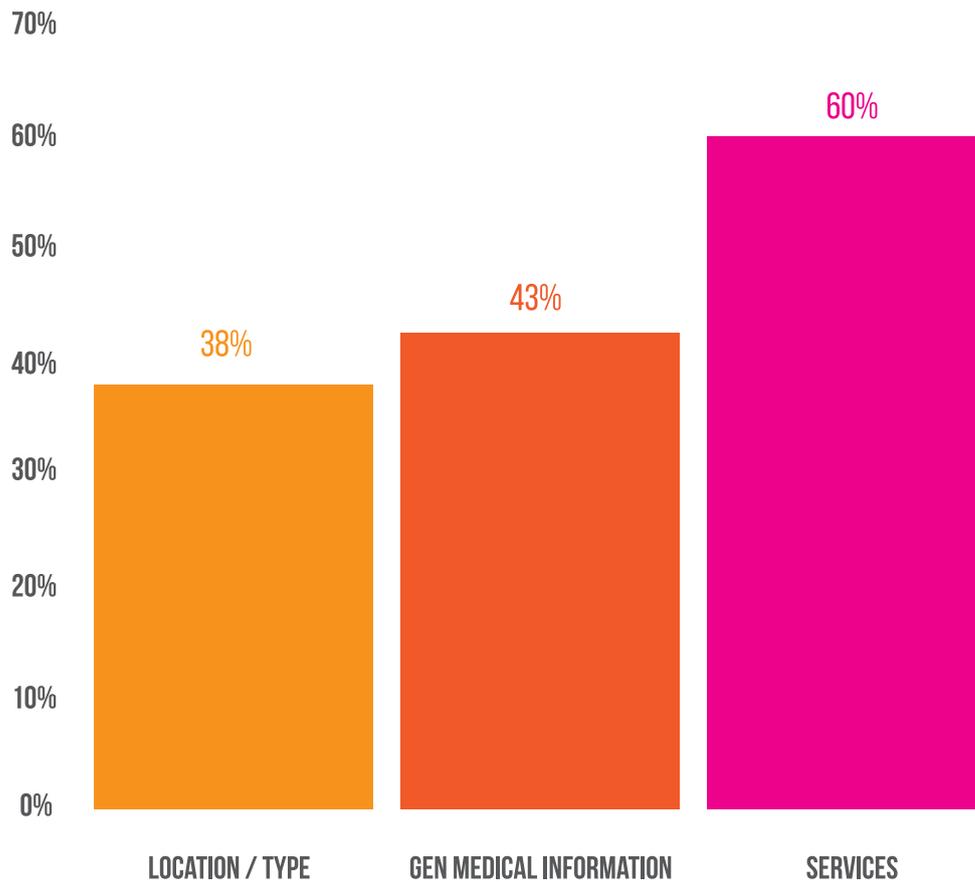
More than 65% of respondents expressed interest in education data such as school performance, teachers and their qualifications, type of school (public or private), costs and scholarships. We collectively termed these are education administration information. As with the demand for health information, there is a Code4Kenya application, FindMySchool meeting this demand for education information. These results were further confirmed by our user experience test respondents who stated that they had previously attempted to obtain in the past education information such as school performance and courses offered.

EDUCATION INFORMATION DESIRED
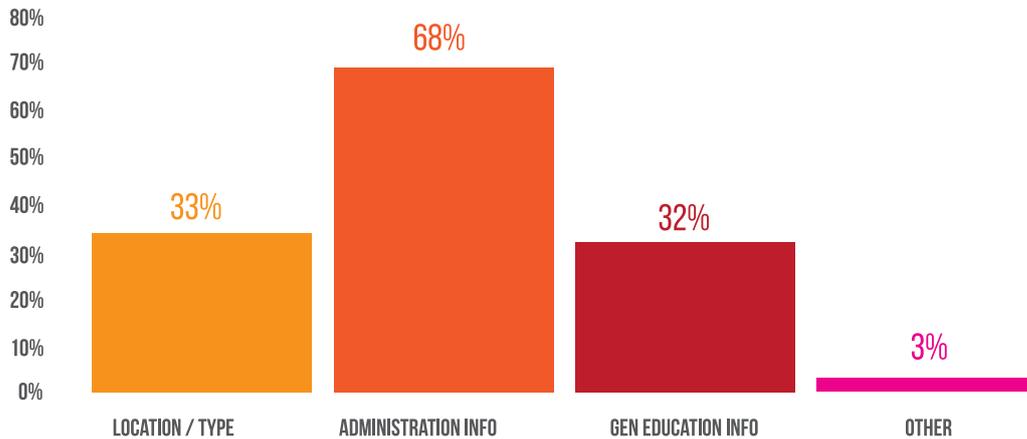
In this regard, the large disconnect between the applications owners and the grassroots community is evident. It can be inferred that application owners were not raising awareness of the services that their platforms were providing to potential end-users who are demanding for this same kind of information.

ii **Access to Technology**

There is a high penetration of technology among grassroots citizens, indicating potential demand for technology intermediaries as platforms of choice to access open data.

Traditional media still plays a large role in increasing citizens' access to government information. 75% percent of our respondents currently seeking government information stated that they received it mainly through newspapers, television and radio. As all our respondents were recruited on the basis that they at least had access to an Internet connection or Internet enabled device, it was not surprising that 54% of these respondents go online to government and social websites to find this information. Similarly, respondents who were recruited for the user experience experiment searched for education related content online websites including those of government education institutions. Field reports indicated that several of our respondents preferred to use a desktop interface to interact with open data as it was easier for them to navigate on a larger screen.

SOURCE OF GOVERNMENT INFORMATION

Source	Percentage
LOCAL ADMIN	3%
PRINT PUBLICATION	7%
OTHER	8%
ONLINE	54%
MEDIA	75%
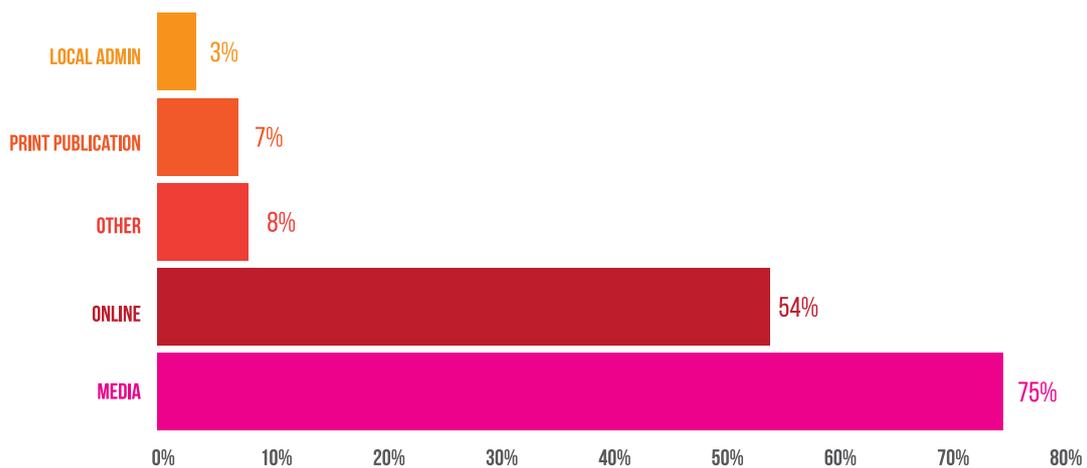
Mobile phone penetration in Kenya is at over 76% and the popularity of the mobile phone as an access-to-information platform was apparent with 46% of respondents showing preference to access open data through mobile web. Similarly, 36% also preferred to use open data mobile applications to access such information on health, water and education. That said, respondents with mobile devices found it difficult to identify the technology applications on their phones indicating a lack proper understanding on the definition of technology applications. Most of these had applications but did not know them by that nomenclature and the researchers had to confirm by physically checking the phones. Social sites such as Facebook and Twitter are also gaining popularity with this demographic (79% and 59%, respectively), particularly our respondents who has access to feature and smart phones.

MOST PREFERRED PLATFORM

Platform	Percentage
OTHER	4%
PRINTED PUBLICATION	22%
DESKTOP	23%
TELEVISION SHOWS	28%
MOBILE APPLICATION	36%
MOBILE WEB	46%

0% 5% 10% 15% 20% 25% 30% 35% 40% 45% 50%

MOST PREFERRED PLATFORM

Platform	Percentage
FACEBOOK	79%
TWITTER	59%
OTHER	56%
WHATSAPP	46%
BROWSER	43%
MAIL	24%

0% 10% 20% 30% 40% 50% 60% 70% 80% 90%
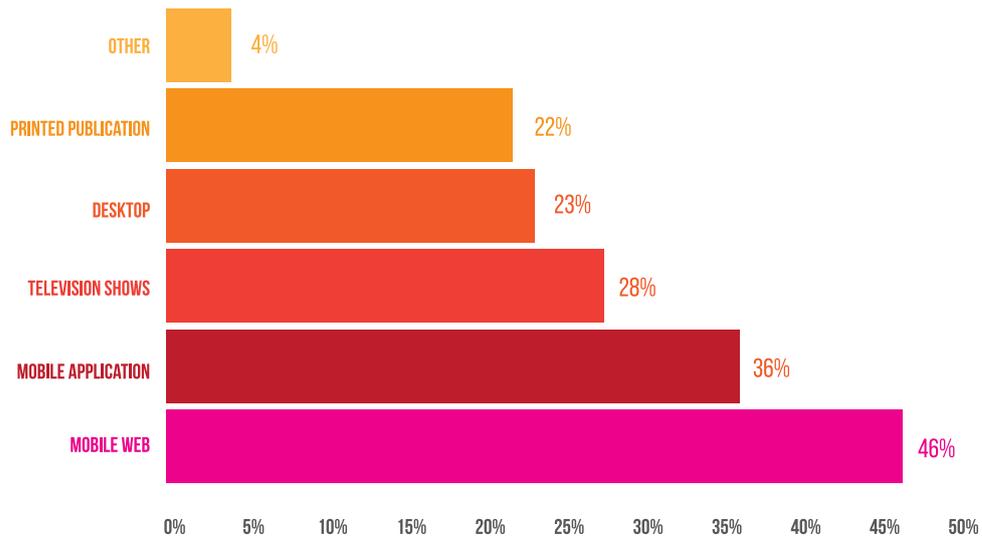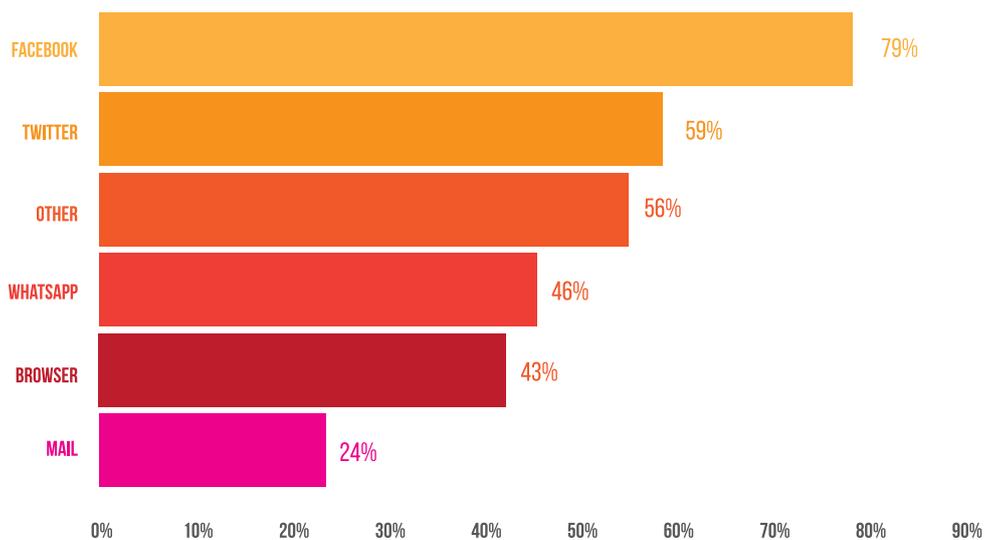
More than half (52%) of the respondents indicated a preference to receive government data as visualizations. Stories and articles were also highly rated with 43% preferring this option. Of the choices provided, fact sheets and raw data got the lowest preference – with only 20% of respondents preferring this method of open data dissemination. Those who selected other options include; word documents, excel documentaries and features, and PDF documents. This preference for means of accessing government information provides an evidence basis for the necessary role of open data intermediaries and in particular data journalism methods. Code4Kenya program objectives aimed to meet this demand indicating potential value for impact from such data journalism and visualization technology intermediary initiatives.

These findings collectively indicate that there is potential citizen demand for open data applications as technology intermediaries. However, a great challenge for the utilization of open data intermediaries to access government data arises from the low awareness levels of these tools.

THE SUSTAINABILITY OF OPEN DATA TECHNOLOGY APPLICATIONS

i   Development And Design of Open Data Applications

Open Data applications rely on data from the national government portal and the sustainability of this a portal, in terms of data quality and supply, consequently influences the sustainability of open data technology intermediary tools.

All the open data applications sampled in this project, including those developed through Code4Kenya, and the independently developed applications, use data from the Kenya Open Data Portal. This data varies from location-based/geo-tagged data of public facilities to different health, education and water sector indicators. The developers mentioned that they use the data provided on the open data platform, manipulate it and simplify the outputs through various visualization methods like interactive maps and graphs. Most developers stated that their applications aimed to demystify data to the grassroots citizen. These technologists further stated that their applications were designed in a way that would make the normal citizen, who has no formal training in data analysis, appreciate data, and in the process enable them to make informed decisions.

Developers have created both web and mobile versions of their applications. From the interviews, the developers revealed that usage levels were higher on the web applications as compared to mobile apps. Web applications allow for better interaction with the datasets as compared to mobile apps. The Kenyan market is dominated by basic phones, which could also contribute to the low mobile application access.

However, several open data technology intermediaries that formed part of our study (both Code4Kenya and other independent applications) do not seem to have sustainable models. As at August 2013, there was no ongoing development or maintenance on Code4Kenya projects due to contractual issues with the initial funders (Personal Communication, Code4Kenya, 2013). Most of the websites are still on beta mode, incubated in the main Code4Kenya site as opposed to live sites maintained by host organizations. It seems that the media houses and Civil Society Organization did not have a sense of ownership of these applications and were therefore still relying on the Code4Kenya pilot program to maintain and develop further the applications. Without this requisite funding, operations and activities around these technology applications ground to a halt. This made it difficult for us to conduct follow up research on emerging impacts, as the applications were not in use.

The sustainability of the government open data portal (opendata.go.ke) did also influence the subsequent sustainability of applications built on the basis of data from the portal. As mentioned above, there is no regular supply of quality data to the open data portal over the past few years. This resulted in the developers interviewed unable to update their applications with relevant data often and rendering these applications obsolete with the value of the content depreciating as well.

ii   Deployment of Open Data technologies

There is little to no outreach on the availability of open data and technology intermediary tools, leading to low awareness among citizens. Further, government remains a primary target audience over citizens.

Most of the owners of the open data applications sampled mentioned that, although their applications made data accessible in forms that the average citizen could comprehend, they were not ultimately targeting citizens with their platforms. They instead identified the Kenyan government as the primary target user, a body that is in fact the same source of the data. In particular, application developers (not affiliated with Code4Kenya) mentioned that their main target audience for their applications was the government. The primary reason one of these developers provided for this was that they perceived that most of the data provided on the platform was 'high-level information'. This was in reference to data such as GDP growth, disease prevalence, poverty rates and constituency expenditure. This developer did not believe that such data could be impactful immediately by solely building citizen-facing applications.

These technology developers instead created visualizations containing correlations of different datasets available on the platform, with which they approached different government bodies including ministries, NGOs working in these sectors, international bodies and businesses to use in making decisions pertaining the services most needed by the citizens. These technologists thus expressed expectations for the government to use the visualizations created by the applications to gain more insight into their own data for planning and informed decision making. In this regards, citizens were deemed a secondary audience.

> *"Our main objective … was to try and find out if the problems faced in the Kenyan health sector can be solved using data correlation and visualization, so that we don't just talk about building more hospitals and employing more doctors yet the problem can be solved through analysis of the data and finding other route courses of diseases in a particular area," one respondent who has built a health data visualization platform said during the interviews.*

Code4Kenya applications, on the other hand, were targeted at mass usage and collaborated with mass media host organizations to avail these tools to citizens. Partnering with media and civil society organization (CSO) ensured that the technology applications could leverage on and tap into their wide audience and grassroots communities. From the interviews conducted with Code4Kenya's lead fellow, it was revealed that the initiative's main target users were the upper-middle class in Kenya. This group of people understands English and has access to the Internet on computers and smartphones. This explained the reason why Code4Kenya's applications were web-based. It was rationalized that this target group would then be used as information champions to Kenyans who have no access to Internet, thereby leading to a greater impact of the applications at the grassroots level.

However, this did not necessarily translate into greater awareness levels of open data within these targeted groups of people. In the case of Code4Kenya, the media houses and CSO did not do any marketing campaigns and only deployed the tools online. Independent application developers also indicated taking a similar approach to deploying their applications. The applications studied have all included links to social media on their home pages. However, these only enable one to share links to the applications on their social media networks. This assumes that the users first get to know of the applications and can then share these further through their networks. None of the application development organizations had strong social media presence and were therefore not engaging and doing outreach to new users through these channels. This was in spite of the fact that a lot of their potential users regularly access sites such as Facebook and Twitter.

In this regard, no strategies were deployed to target specific users, be it the general public or the government itself, translating to the low awareness levels and ultimate impact as discovered on the ground during the exploratory study. A few of the developers mentioned that they participated in open data conferences where they talked about their applications,

but this did not seem to increase public awareness of the existence of their applications. Developers thus admitted to not actively maintaining or developing further their applications, with the low usage cited as the reason behind poor motivation to work on the applications. In order to increase the usage, and ultimately the impact of open data applications, it is imperative for the open data intermediary initiatives to carry out more awareness initiatives directed at their end users, including advertising and marketing in various public fora and media.

iii   Utility and Usability of Open Data Technologies

Technology intermediary tools have the potential to improve access to open data among citizens by presenting open data in an easy-to-comprehend manner using appealing designs, layouts and synthesized content.

Given the low awareness among our research participants in the survey, we used lab-based user-experience evaluation to understand how grassroots citizens could potentially use existing open data applications. We created real life scenarios to test the functionality of sample open data education applications, which provide similar information and, extrapolate their experience to how citizens would potentially derive utility from open data applications. Open data applications were perceived to be more appealing by our research participants than the main open data portal. The respondents found it easier to extract and understand information from the technology intermediary tools, than the main open data portal. This was especially evident when participants were only able to locate data about a local primary school, Naivasha Primary School, on both Kenya School Report and Find my School applications but none of them was able to carry out this particular task on Kenya Open Data. The main reason provided by participants for this observation was that the KODI platform was too difficult to understand and navigate and that there was too much information.

Open data applications sampled were also observed to be user-friendly with rich content and media. The participants in the usability evaluation tended to favor the intermediary applications, Kenya School Report and Find My School, over the main opendata.go.ke portal due to the fact that they were relatively easy to navigate through. The designs and fonts of these applications were also pleasing to the respondents. Rich media such as videos were also points of attraction to the users. The Kenya Open Data site was too complex for all the participants, which they stated to be 'cluttered'. This was contrary to the feedback given by developers who found the portal user friendly and meeting their needs. On Kenya School Report and Find my School all the participants were able to accomplish different tasks.

It is revealed the need to be aware of different user segments and tailor platforms to meet the needs of each kind of user. While developers find the government portal easy to use, grassroots citizens may not be able to use the data as presented in the portal. These findings highlight the key role that technology intermediary tools play in contributing to improved citizens' access to information. Technology intermediaries tailor the data and present the information in formats or layouts that appeal to less technical audiences. It is recommended that opendata.go.ke needs to be redesigned if it is to be attractive and useful to citizens.

Other feedback from these user experience studies corroborated our findings from the exploratory survey was in the desired government data and information. Experiment participants were interested in information such as school ranking by performance; types of institutions registered under the Kenya Institute of Education; school contacts; facilities available in schools and other extra-curricular activities and; student per class ratio within the schools. This data is available in the sample platforms but the low awareness levels prevent them from meeting this demand.

SUGGESTED FRAMEWORK FOR IMPACTFUL OPEN DATA TECHNOLOGY INTERVENTIONS

Based on our findings we put forward the following recommendations in a framework of ideal factors that would increase the utilization and impact of open data applications.

HIGH QUALITY DATA

High quality data is required to improve the utility and functionality of open data intermediary platforms.

From our research findings, the supply and quality of the available data on the national open data platform and other initiatives greatly hinders the use of the KODI platform. This low data quality data on the KODI platform was inherited by the applications drawing their underlying data from the portal and, consequently, negatively affecting the overall data quality and ultimate value found from these applications. Developers stopped maintaining open data applications, as there was no new data to update them with.

In order to ensure high quality data, it is recommended to open data initiative owners in developing regions to ensure that the data has information relevance – this data contributes to the increased access by the public to valuable knowledge. There was a clear information mismatch between some of the data and government information that was available on the technology applications and what citizens really wanted (job opportunities and information on quality of services provided in different regions). This component is necessary for impactful open data technology intermediaries as ultimately, there will be significant low adoption, even if all other enablers for open data ecosystems are at optimum levels.

Another key contributor to relevant open data technology intermediaries is provision of regularly updated datasets. While the life cycle of different data sets such as census and household surveys vary, other data on open data platforms should be as regularly updated as possible. However, in order for this to be a reality, government agencies need to have a legal framework or policy in place that describes a public release schedule to frequently publish their data as open data.

Additionally, readily usable open datasets are useful in increasing the utility of the data in application development. The developers interviewed stated that they had to spend time finding and cleaning open data for their platforms and sometimes complementing it with additional data from other sources. This process is time consuming and assumes a level of expertise in liberating and structuring data. Poorly structured data made it difficult for developers to extract and use the data from the platform directly into the application. High quality and availability of data on the national open data portal directly influences the quality of information available on intermediary platforms and consequently, their contributions to open data impacts in grassroots communities.

CLOSED CITIZEN FEEDBACK LOOPS: LISTENING TO DATA DEMAND

To emphasize on results described in the previous section, there is evidence that indeed, citizens are searching and do find government related information; 62% of our survey respondents stated that they currently received information on services from the government. However, this need for access to information is not currently met by the national open data initiative, as there was very little knowledge of KODI among our respondents.

Other intermediary efforts have also not succeeded in improving access to government data, a fact that can be inferred from the lack of awareness and low site usage (from the dashboard analytics) of the Code4Kenya tools and other open data applications. Consequently, some of the developers working on these applications mentioned that they had also abandoned their applications or shifted priorities to other development projects due to this low awareness and usage.

One of the findings we found very interesting is that approximately 50% of education related information desired by those surveyed does exist in both the KODI platforms and the applications built. The lack of awareness in this case contributed to the loss of potential citizen engagement on the platforms through this necessary information.

A key lesson to be learnt here is the necessity of robust and iterative ways for the custodians of the Kenya open data initiative and new application developers to define, understand their target users and use their platforms to meet their demands and needs. The ICTA recently carried out a survey of user perceptions on the opendata.go.ke platform and hopefully, these results will be used to improve the quality of data, the technology design and other decisions critical to meeting end user demands. Sustained citizen engagement on the open data technology platforms ensures the data provided is demand-driven. This not only contributes towards improving the quality of the available data but also the general usability of the platforms. This feedback first and foremost ensures that there is no information mismatch – between what the open data platforms are offering and what citizens are demanding for. Further, the feedback provides insights into how citizens are using the platforms and any challenges that would hinder their access to this government information through the site.

Citizen feedback should not be one way. There is a need to also increase awareness levels of these platforms. Through collaborative efforts with institutions close to grassroots communities such as mass media and civil society organizations, technology intermediaries can leverage on and tap into their wide audiences at the grassroots to raise awareness of their applications. Due to the fact that traditional media is still very influential, we suggest popularizing applications build on the open data platforms through traditional media to increase awareness. Generating awareness on these platforms through TV adverts and other awareness raising campaigns is required to target the specific end-users that the application developers have in mind. This is even more necessary in areas of high population where amenities such as water and health services are unreliable or inadequate. Media houses can also play a big role in not only popularizing the portals but in helping to disseminate the information provided (through data journalism activities).

Most people seemed more aware of e-government initiatives, sometimes confusing it with the Kenya Open Data Portal. It is recommended to the government to use similar outreach strategies as those used to popularize e-government to increase awareness of open data initiatives among citizens.

Cyber Cafés emerged as interesting avenues for popularizing the open data initiatives as grassroots citizens usually accessed other government programs such as Personal Identification Number (PIN) registration. Forming partnerships with such social amenities could be useful to promote the utilization of datasets on the open data portal.

USER- CENTERED TECHNOLOGY DESIGN

Well-designed and implemented technology intermediaries enhance access and usability of open data. Observations from our usability experiments indicated that participants found the KODI platform difficult to navigate and were unable to access the specific information they were interested in. Five of the nine user experience test participants did not find the information they were looking for on the KODI platform and only two respondents expressed full satisfaction in using the portal. Most of the respondents who struggled to find specific data on the platform mentioned that they were overwhelmed by the amount of information on the portal. As a result, they did not think that it was user-friendly.

When using the other applications tested, however, participants found them relatively easier to navigate and they were successful in extracting the information of interest to them. The diagram below illustrates average scores of user preferences in terms of general design and usability as well as information therein, when exposed to the different platforms.

KENYA OPEN DATA INITIATIVE

DESIGN

DATA

0   5   10

CODE FOR KENYA

DESIGN

DATA

0   5   10

INDEPENDENT KENYA SCHOOL REPORT

DESIGN

DATA

0   5   10
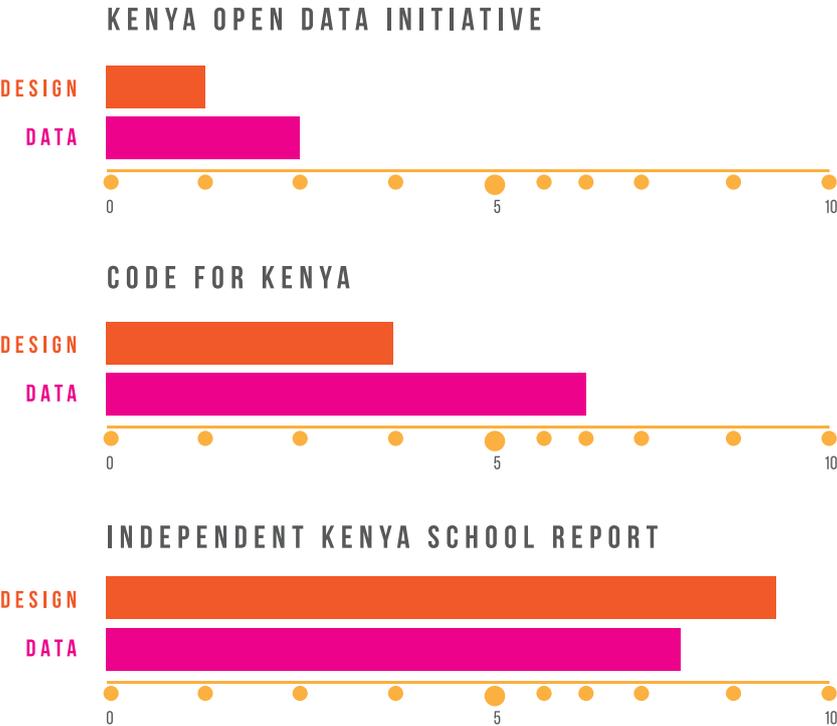
Well-designed technologies consider the end-users' experiences in terms of functionality and usability of the platforms. Citizens taken through our usability evaluation indicated a general preference for the open data applications. This was as a result of better appeal of the sites due to good designs and layout and easily digestible content. This improved the overall navigability of the platforms and information was easily extracted from these applications.

Other design decisions that need to be considered include the platform of access. While respondents preferred to access the data from desktop computers due to increased ability to manipulate the data, most people only have access to mobile devices. These platforms should therefore consider putting effort to optimize their content and sites to be accessed from different devices.

Social sites such as Facebook and Twitter are also popular with feature and smart phone users and would also be a great avenue to advertise or even display open data information especially to the youth demographic in low-income areas that mostly own feature phones. Integrating social sites with the open data portals could also be a great way to promote and popularize its use and, act as information intermediary open data applications themselves. Overall, the Code4Kenya initiative faced numerous challenges more so in meeting one of its main objectives of increasing the uptake of open data information from the KODI platform. As one of its recommendations on how to promote end-user participation in open data, a report by TechPresident and the engine room encourage the building of applications as a last priority - after user engagement has been done.

> *"We've learned that when you start with a products first, and then go backwards to analyze the needs of those that would use the product, it's a massive failure. We should learn from the for-profit industry, where they do a market analysis to make sure they are actually putting their product in places where people will want it and use it"* (Vila 2014).

CONTENT – FROM DATA TO KNOWLEDGE

Open Data intermediaries tend to synthesize data from the main open data portal. Some initiatives such as Code4Kenya further complimented this data with data scrapped from within media houses as well as data from other sources. In aggregated formats this information provides richer content for users to generate knowledge from.

Capacity building is thus vital as it is not enough to just provide data that people want but also enable them to extract and use it. This is especially important for info-mediaries and organizations such as the media who may want to incorporate data-based reporting to the general public.

This may even require frequent workshops and events to promote open data (Mutuku, Colaco and Omenya 2013, Vila 2014). Code4Kenya aimed to build in-house capacity on how to extract and use open data in the host media organizations. "This targeted approach potentially gives the host organization a direct way of including data journalism or data based business models into their structures rather than training all staff to use the platforms." Moreover, it is recommended that institutions with expert knowledge on some of these social issues should collaborate with technology developers to create impactful open data content. This will not only assist these organizations to build in-house capacity to work with data, they will also provide additional support to developers in synthesizing useful content from the data, that can be directly used by grassroots citizens. Expert advisory in thematic areas is indeed useful to understand the trends and analyses and interpret these findings from the data to users.

THE CONTEXT OF OPEN DATA

We recommend that in the case of any open data intermediary interventions, other macro factors and contextual settings in which open data lies affect the impact that these interventions may have. This includes the political, legal, social and economic contexts. For instance, in the case of Kenya open data, there is a need for legal frameworks to define what open data is, how government institutions release open data and when this data should be released. Without these frameworks key success factors of open data such as the constant supply of open data may be hindered, which threaten the sustainability of the initiatives. Buy-in from other major decision makers and key stakeholders, is key in assuring the continuous supply of up-to-date information and reliable data. This key relationship was missing in the Code4Kenya initiative causing most applications to stall due to availability of data (Mutuku, Colaco and Omenya 2013). Political will within government is also necessary to ensure the initiation and propagation of government open data initiatives. Where there is a culture of secrecy, open data proponents may have an uphill battle to fight in order to access and release to the public these privately held datasets.
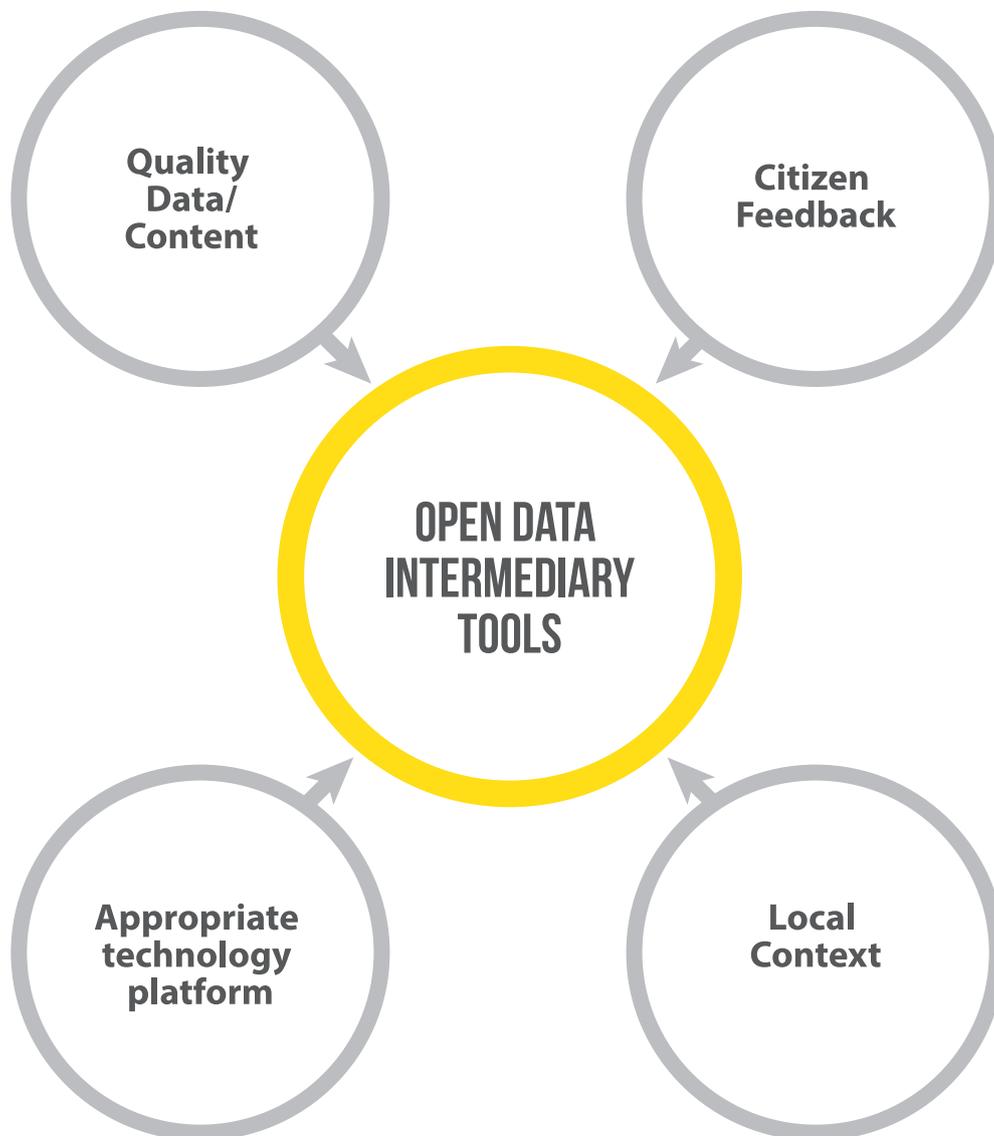
Figure 7: *Framework of Ideal Open Data Applications and necessary input.*

CONCLUSIONS

In this project we tried to understand the impacts that open data has had in grassroots communities, given the national open data initiative is now three years old. In particular, intermediary interventions have been created to help increase the grassroots community's access to this open data. We examined interventions by private initiatives such as Code4Kenya and other independent open data applications developed.

High quality data is required to improve the utility and functionality of open data intermediary platforms.

Our research further laid out the different contexts that have contributed to the proliferation of open data initiatives including how political, legal, historical, social, economical and organizational contexts have influenced Kenya's open data ecosystem.

These open data initiatives have managed to contribute to information propagation. While these initiatives may have not sufficiently met their initial goals of disseminating information to the grassroots level to improve on government accountability and transparency, these interventions have to some extent been able to open up data that is now accessible to users when they access the different platforms. In this regard, these initiatives have contributed towards the creation of new applications that directly use open data. KODI led to the creation of several community apps while Code4Kenya led to the creation of four applications run by the host organizations.

These different initiatives have set examples of models for information dissemination via open data. At the time of launch, Kenya was the second African country to commence an open data portal after Morocco. Since then, numerous studies have been conducted on how to open up government data, with Kenya as a case study. Code4Kenya on the other hand was a pre-incubator with one of its objectives being to create a toolkit on how to increase open data consumption through relevant technologies for a greater impact at grassroots level.

There is quite a high demand for information on the three thematic areas - water, health and education particularly information on how to access these services as provided by the government. Traditional media sources such as television, radio and newspapers are the main ways that citizens are accessing government information.

These initiatives are using different methods to deploy their interventions thus impacting citizens' lives. An early evaluation of these impacts shows that there is poor citizen response and utilization of open data intermediary applications. This is mainly because grassroots citizens are not aware of these interventions. The owners of these initiatives have also not put in much effort in awareness raising activities. Further, information mismatch between information available within the platforms and those sought by citizens seems to contribute to the low usage of open data applications.

While mobile platforms are increasing in popularity, especially due to their ease of use and accessibility, open data intermediary interventions are mainly on web platforms. This technology design may be locking out a large group of citizens from accessing open data. These technology applications have not specifically met the needs specified by in the different thematic areas indicated above. Citizen feedback is critical to ensure that there is no information mismatch between the information that citizens demand for and that available on the open data platforms and intermediaries. Integrating social sites to the portals could also be a great way to promote and popularize its use, and promote interaction between the users and those that maintain the portals.

There is a clear indication that open data technology intermediary interventions do improve citizen access to government information based on the experiments we conducted. Citizens were easily able to locate information from the intermediaries as opposed to the challenges they faced locating information on the main open data portal. The technology design and content composition are key contributors to this ease of access.

Despite the existence of open data for three years, it is too early to study long-term impacts. A lot of consideration and effort still has to be put towards user-centric creation and effective deployment of open data technologies before these impacts can be realized at the grassroots level.

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