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SITUATION ANALYSIS ON THE CAPACITY OF KENYA TO USE MOBILE TECHNOLOGIES FOR DATA COLLECTION AND DISSEMINATION

March 2015

University of Nairobi,
School of Mathematics,
P.O. Box 30197-00100,
Nairobi, Kenya
24th March, 2015

To:
Ms. Josephine Marealle - Ulimwengu,
Officer-in-Charge, Office of Partnerships (OP)
United Nations Economic Commission for Africa (ECA)
P.O. Box 3001
Addis Ababa, Ethiopia

Dear Madam,
RE: SITUATIONAL ANALYSIS REPORT SUBMISSION

We, the undersigned, offer to provide **the Situational Analysis report on the Pilot Project on use of mobile technologies for data collection in Kenya** in accordance with the signed agreement between the United Nations Economic Commission for Africa (ECA), the Kenya National Bureau of Statistics (KNBS) and the School of Mathematics, University of Nairobi dated **19th November, 2014**.

We are hereby submitting our report, which includes the situational analysis of the state of mobile technology usage in Kenya, current strengths in our data collection systems and areas that need possible improvement.

We remain,
Yours sincerely,

_____
Prof. Patrick Weke, University of Nairobi, School of Mathematics.
Nairobi, Kenya.

_____
Mr. Cleophas Kiio, Kenya National Bureau of Statistics,
Nairobi, Kenya.

Table of Contents

LIST OF FIGURES iii
EXECUTIVE SUMMARY iv
1.0 INTRODUCTION 1
1.01 Overview of the Project 1
1.02 Advantages of Online Data Collection 2
1.03 Objectives of the situation analysis 3
1.04 Scope of the current situational Analysis 4
2.0 FINDINGS 6
2.10 Mobile Cellular Subscriptions 6
2.01 Fixed Telephone subscriptions per 100 Inhabitants 9
2.02 Fixed (Wired) internet broadband Subscriptions 9
2.03 Mobile internet broadband subscriptions 11
2.04 Internet Subscriptions 12
2.05 Percentage of Individuals using the Internet 14
3.0 COSTS IMPLICATIONS FOR DIFFERENT MOBILE TECHNOLOGIES 16
3.01 Cost effectiveness of Mobile Phone Voice (call centre surveys) 16
3.02 Cost of IVP, USSD, etc mobile phone surveys 16
3.03 Cost of wired Broadband Connection 17
3.04 Summary of Cost Analysis 18
4.0 MOBILE DATA COLLECTION PROJECTS INVENTORY FOR KENYA 22
5.0 KENYA NATIONAL BUREAU (KNBS) CAPI EXPERIENCE 25
5.01 Challenges in CAPI implementation at KNBS 26
5.02 Advantages of CAPI methods by KNBS experience 27
6.0 DATA DISSEMINATION 28
6.0 CONCLUSIONS AND RECOMMENDATIONS 31
7.0 References 33

LIST OF FIGURES

Figure 1: Mobile Cellular Subscriptions in Kenya between the years 1991 and 2013 7
Figure 2: Short Messaging Service 8
Figure 3: Minutes of mobile phone usage per month 8
Figure 4: Fixed Telephone Subscriptions per 100 Inhabitants 9
Figure 5: Fixed (Wired)-Broadband Subscriptions 10
Figure 6: Fixed (Wired)-Internet Broadband Subscriptions in Kenya versus other developed countries 11
Figure 7: Broadband subscriptions 12
Figure 9: Internet Users and Percentage of individuals with Internet access 14
Figure 10: Percentage of individuals using internet in 2012, East and Central African countries 15
Figure 2: Cost of wired Broadband connection in 2008 in Select African Countries 17

EXECUTIVE SUMMARY

Statistics play a crucial role in the overall policy formulation process of countries by providing the evidence for setting objectives, targets and priorities. The issue of great concern however, has been how to collect data easily, cost effectively and in a manner that may allow easy data management, cleaning and analysis. If data was to be available in a form that is useful for evidence based research and for purposes of policy making, such data has to be collected in a professionally acceptable and in a cost effective manner.

Currently, paper-based methods have been predominantly used to collect survey data especially in the developing nations of Africa and the Middle East. Such paper based methods involve printing of the paper questionnaires, transporting them to and from the field and getting them to a central location for data entry. The process is cumbersome, requires a lot of personnel and person time and furthermore is prone to a lot of errors at data entry.

Computer Assisted Interviewing (CAI) methods are increasingly replacing pen-and-paper methods of survey data collection. On a positive note, CAI methods are faster, allow automatic transfer of the survey data to central database, easy cleaning of data and reduced operation costs of conducting the survey. On the other hand, CAI methods may have high initial costs and running costs, related to computer hardware, software and related infrastructure purchases and establishment.

The challenges that come with use of mobile data collection technologies is however minimized, though by the increasing availability of handheld devices such as mobile phones, tablets and personal data assistants (PDAs) among the general populace, resulting in affordable CAI alternatives.

In Kenya for instance, mobile communication devices (phones) penetration now stands at 80.5 per cent, representing a total population of almost 32.8 million out of the current approximately 40 million Kenyans. The percentage of the population with internet access in Kenya has also gone up markedly over the last few years. The population that has access to internet in Kenya has maintained an upward trend to stand at 57.1 per cent currently. These numbers imply that deploying mobile data collection by Computer Assisted Personal Interviewing (CAPI) methods have the potential of meeting the thresholds for sample surveys, i.e., to reach the target population in a fairly representative way.

1.0 INTRODUCTION

1.01 Overview of the Project

Currently, Kenya's national statistical system use mostly manual, paper-based data collection methods for specialized surveys, which provide the bulk of statistical data. Paper-based methods involve printing of the paper questionnaires, transporting them across to the fieldworkers, and getting them back to a central location.

These traditional methods therefore have the following challenges[1]:

- The process is often a lengthy process beginning with manual fieldwork activities, data collection and transportation, data entry and cleaning among other tasks, especially in situations where large surveys are involved.
- The process also requires a lot of personnel for data collection and capture, thereby exacerbating the financial constraints.
- The amount of errors involved in data collection and entry is huge, especially due to over-reliance on less skilled data enumerators.
- Creating hundreds of copies that must be accurate and complete, collating, packaging, transporting, multiple data handlers, various levels of investment, and so forth.
- Paper and pencil research methods are often expensive when all costs are considered, especially materials and labor costs.

Due to these challenges and other problems, Computer Assisted Personal Interviewing (CAPI) methods are increasingly replacing pen-and-paper methods of survey data collection. The common advantages of CAI methods include:

- automatic transfer of the survey to central database;

[1]https://www.psychdata.com/content/comparison.asp

- automatic validity checks;
- automatic data cleaning;
- more control of question sequencing by the interviewer;
- easier to scale up (or down) and adapt for other surveys;
- more privacy due to the reduction in intermediate processing and cleaning

However, a disadvantage of CAPI methods is the initial and running costs of computer hardware and related infrastructure. This is minimized though by the increasing availability and power of handheld devices such as mobile phones, tablets and personal data assistants (PDAs) which has resulted in affordable CAPI alternatives.

1.02 Advantages of Online Data Collection[2]

Rapid developments in communication technology and the relatively low cost of online data collection, compared with other methods, mean that it is almost inevitable that online data collection will be implemented more widely in the future.

Computers considerably reduce the amount of work associated with data collection, by automating some phases (e.g. data entry, coding) and omitting others entirely (e.g. printing and posting back the questionnaire).

Error reduction in online data collection is, primarily, and similar to other computer-assisted modes, linked to a reduction in clerical mistakes during data entry (e.g. typographical errors and misplaced completed forms). Carefully designed digital questionnaires, whatever their digital form, ensure that respondents only answer questions that are relevant to them. In this sense, online data collection (and computer-assisted data collection in general) is more accurate than traditional modes of data

[2] *TECHNICAL REPORTComputer-assisted and online datacollection in general population surveys:* Katerina SkarupovaSeptember, 2014

collection. However, surveys using online data collection may introduce other types of error — especially those related to coverage, sampling and non-response.

Today, survey software has a simple and user-friendly interface that allows for high levels of interactivity and variability. Similarly, online data collection moved from emailed questionnaires to easy-to-use web applications. It is now possible to add audio-visual elements and allow respondents (and interviewers) to work with touch-screen devices.

The main issue arising from the comparison of computer-assisted modes with traditional ones is the perception of privacy. Self-completion surveys always produce lower bias. It is associated with higher willingness to report a sensitive behavior (including substance use or experience with sexually transmitted diseases). When both computer-assisted and traditional modes require self-completion they provide comparable results, implying that the effect of computerization on respondent is much less pronounced than the effect of perceived privacy.

1.03 Objectives of the situation analysis

Main Objective: To establish the capacity of Kenya to use mobile technologies to collect and disseminate data. The overall aim is to strengthen the existing capacity for mobile technologies for efficient data collection leading to effective policy and decision making.

The specific objectives of the situation analysis include:

- To document the extent of mobile technology use in Kenya
- To determine current rates, trends, service providers and behaviors that determine current and future mobile technology practice for data collection in Kenya

1.04 Scope of the current situational Analysis

The scope of the current project is to conduct a pilot study in Kenya based on mobile technology for data collection. It will build on the lessons learned from statistical activities that are already using handheld devices for data collection and dissemination across multiple sectors, such as health, socio-economic development, agriculture, natural resource management, and disaster relief. It will also make use of the existing statistical structures at the Kenya National Bureau of Statistics (KNBS), in collaboration with University of Nairobi to test, adapt and where necessary develop new mobile data collection systems. It seeks to ensure that KNBS is empowered to produce reliable, comprehensive, timely and integrated statistics by utilizing CAPI methods on android powered devices. The android OS is being adopted because it is currently the most commonly used platform for tablets and smart phones, compared to similar platforms such as Microsoft Windows since it is supported by many different mobile device manufacturers. The scope of the project will also include developing a model data import and processing system for consolidating the collected data into a single database, based on agreed processes and data exchange mechanisms.

The current situational analysis of the extent of use of mobile technologies in Kenya shall be based on the following core indicators on ICT infrastructure and access as identified by ITU[3] and UNDP[4].

- Fixed telephone subscriptions per 100 inhabitants
- Mobile cellular subscriptions per 100 inhabitants
- Active mobile-broadband subscriptions
- Fixed(wired)- broadband subscriptions
- Households with a computer

[3] International Telecommunications Union (ITU): http://www.itu.int/en/ITU-D/Pages/About.aspx
[4] United Nations Development Program (UNDP).

- Households with Internet access at home
- Individuals using the internet
- Data services or Internet subscriptions

2.0 FINDINGS

2.10 Mobile Cellular Subscriptions

Mobile phones subscription has been on an exponential growth in Kenya from very low figures close to zero in the year 2000 to 30.4 million subscriptions in year 2012, 31.2 million in 2013, implying over 30 million subscriptions barely one decade later. Figure 1 below clearly indicates this scenario. According to Communications Authority of Kenya (CA), sector statistics report for quarter 1 of the financial year 2014/2015 (September 2014), mobile subscriptions increased to 32.8 million from 32.2 million subscriptions registered during the previous quarter (June 2014), representing a growth of 1.6 per cent. The number of new subscriptions registered during the period was 522,435 compared to 416,390 new subscriptions recorded during the preceding quarter (June 2014).

To indicate the extent to which the registered phones are under active use, some of the following indicators are useful:

- The numbers of SMS sent during September 2014 period standing at around 6.9 billion.
- The Minutes of Use (MoU) per month for each telephone subscriber increased to 81.9 minutes during the September 2014 period.
- The amount of money transacted through the mobile money transfer service grew remarkably from KSh 672 billion as at June 2012 to KSh 914 billion as at June 2013. Domestic calls traffic, which entails total call minutes made locally, rose from 27.6 billion in 2012 to 30.0 billion in 2013.

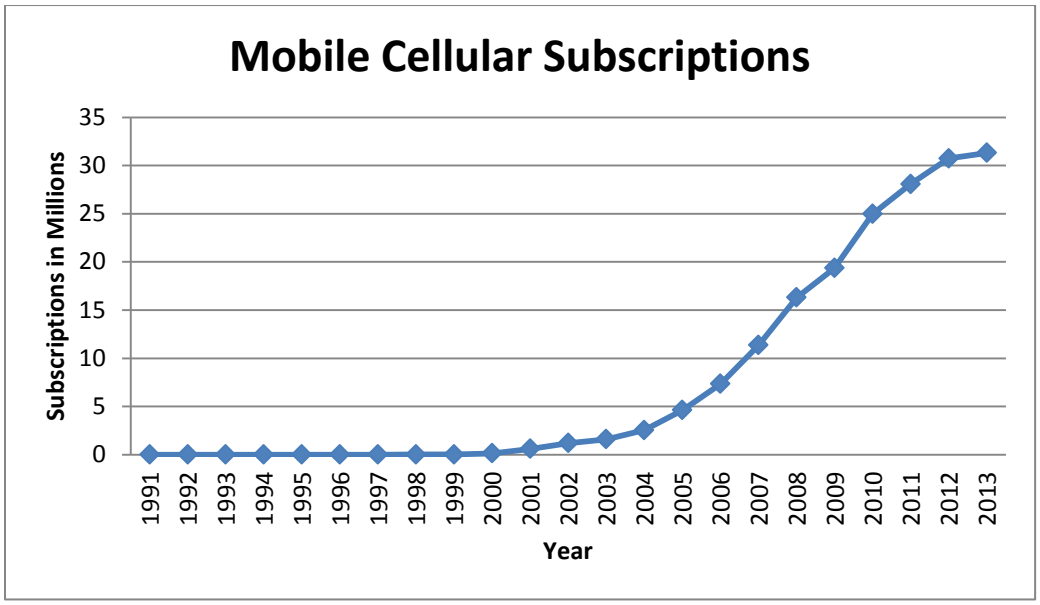

Figure 1: Mobile Cellular Subscriptions in Kenya between the years 1991 and 2013

Source: ITU World Telecommunication/ICT 2001-2013 Database.

To indicate the extent to which the registered phones are under active use, the number of Short Messaging Service (SMS) and minutes of phone usage are key indicators. This numbers are also on the increase, with SMS sent during September 2014 period standing at around 6.9 billion as shown in Figure 2. The Minutes of Use (MoU) per month for each telephone subscriber increased to 81.9 minutes during the September 2014 period.

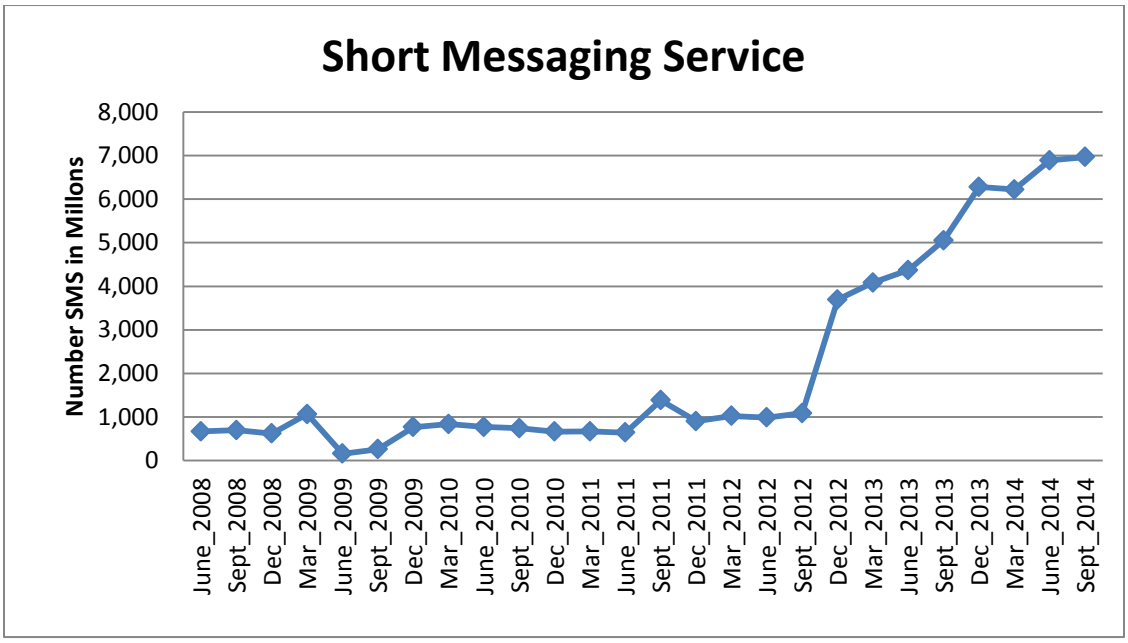

Figure 2: Short Messaging Service

Source: CAK Sector reports for various quarters (2008 to 2014)

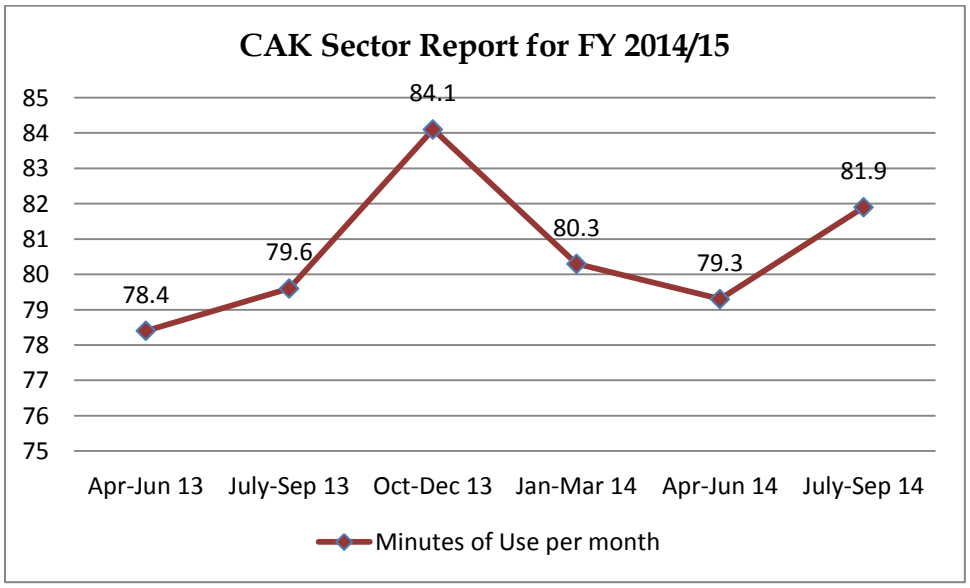

Figure 3: Minutes of mobile phone usage per month

Source: Communications Authority of Kenya sector report for Financial Year 2014/2015.

2.01 Fixed Telephone subscriptions per 100 Inhabitants

Although the mobile phone subscription rates are on a very steep rise, the telephone subscription figures for fixed telephone are generally very low in Kenya. Figure 4 below shows a sharp increase from 0.7 subscribers per 100 inhabitants in 2006 to about 1.7 subscribers per 100 in 2009, but then followed by a very steep decline to 0.3 subscribers per 100 in the year 2013. Low subscription figures for fixed telephone connections are however not a key impediment to mobile data collection technology that is envisaged in this project.

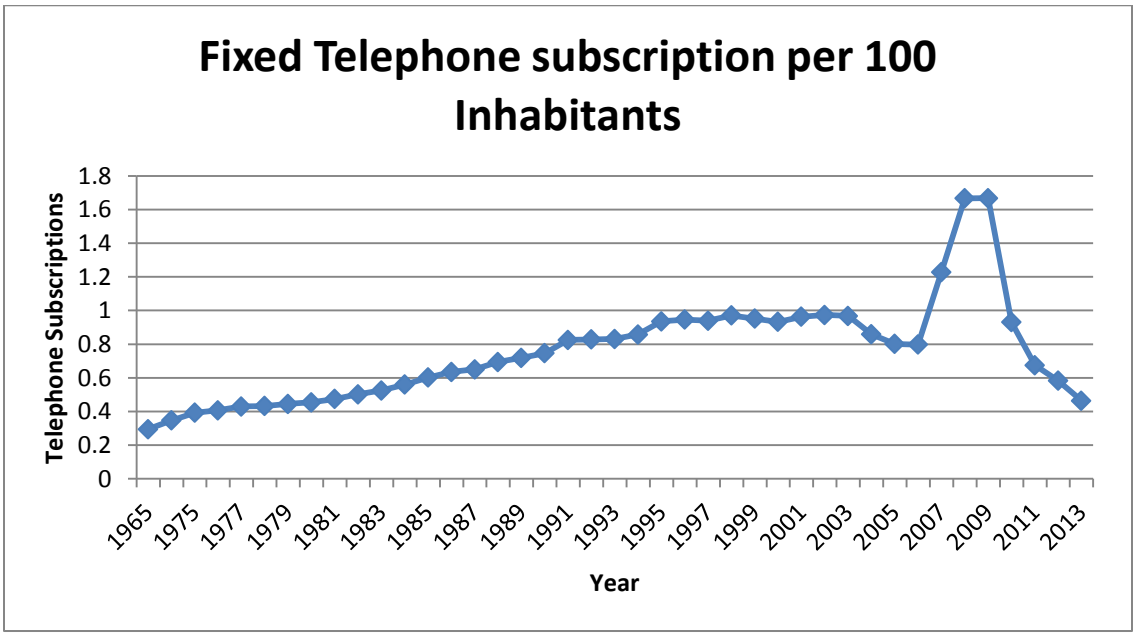

Figure 4: Fixed Telephone Subscriptions per 100 Inhabitants

Source: ITU World Telecommunication/ICT 2001-2013 Database.

2.02 Fixed (Wired) internet broadband Subscriptions

Bandwidth: Bandwidth is a bit rate measure of available or consumed data communication resources, expressed in bits per second or its multiples. Bandwidth

availability is a major driver of broadband services[5]. The total bandwidth capacity increased by 50.1 per cent in 2013 compared to a 32.0 per cent increase in 2012 due to increase in the undersea capacity, which rose to 862, 210 Megabits per second (Mbps) in 2013 from 574,054Mbps in 2012, while the satellite capacity declined to 264 Mbps mainly on account of its use as a backup for the fiber network. Out of the available bandwidth capacity, only 42.4 per cent is utilized. The low utilization of the bandwidth may be explained by the slow adoption of the technology by organizations and enterprises.

Figure 5 below clearly shows an increasing trend in fixed broadband subscriptions from the year 2005 to 2013. This number however stays far below in comparison to developed countries. We took for instance Germany and South Africa to visualize the subscription levels in Kenya versus other countries that are doing well. It is clear that the subscription levels in Kenya are very low and do not favorably compare (see Figure 6).

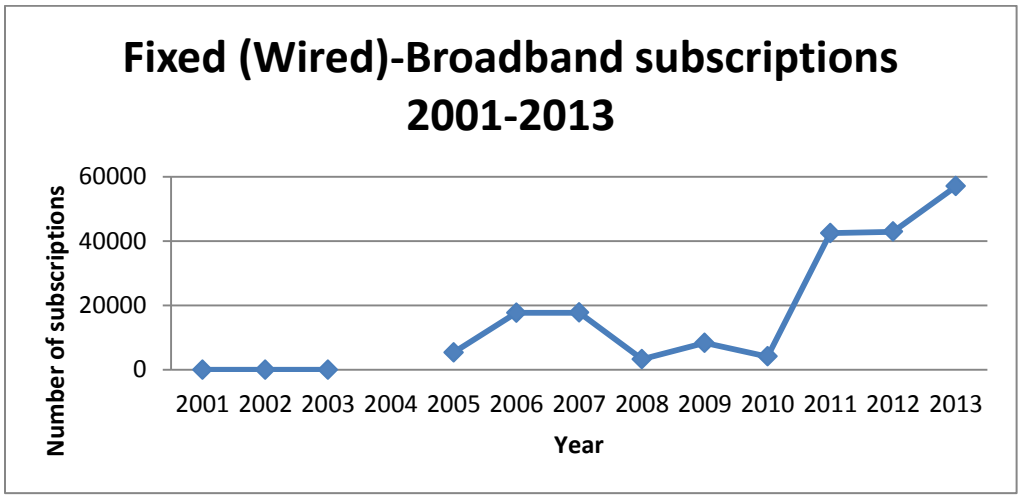

Figure 5: Fixed (Wired)-Broadband Subscriptions

[5]Kenya National Bureau of Statistics, Economic Survey 2014.

Source: ITU World Telecommunication/ICT 2001-2013 Database.

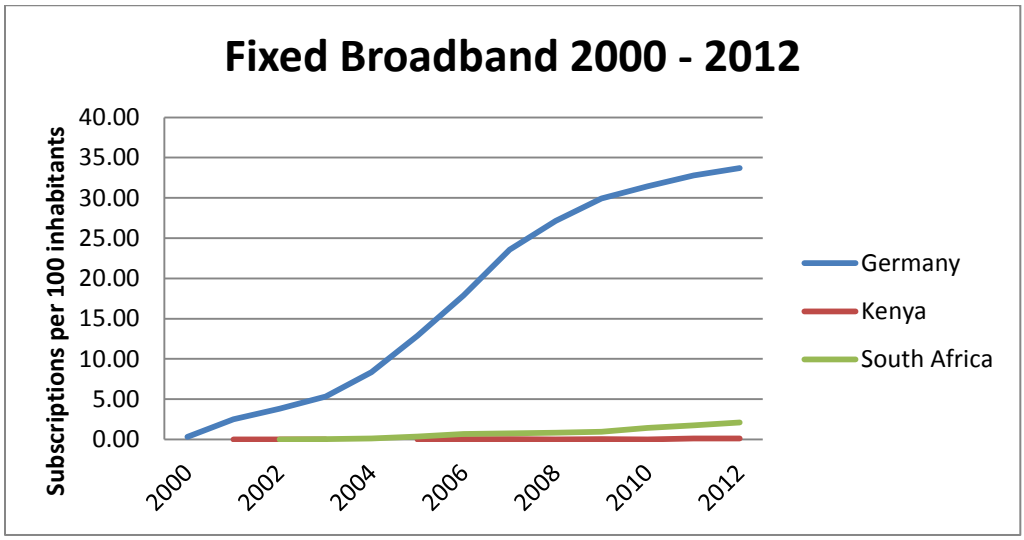

Figure 6: Fixed (Wired)-Internet Broadband Subscriptions in Kenya versus other developed countries

Source: ITU World Telecommunication/ICT 2001-2013 Database.

2.03 Mobile internet broadband subscriptions

However, mobile broadband subscriptions have been on the rise in the recent past in Kenya. As Figure 7 illustrates, mobile broadband subscription recorded 2.95 million subscriptions in the period September 2014. Fixed internet broadband subscriptions registered a decline in the same period. The decrease in fixed/wireless broadband subscription was mainly attributed to declining fixed lines, decrease in satellite broadband subscriptions and wireless broadband subscriptions that recorded a decline during the 2014 period. However, total broadband subscriptions have grown over the last four years owing to the increase in the active mobile broadband, which accounted for 94.0 per cent of the total subscriptions in 2013. Total broadband penetration increased from 2.5 per cent in 2012 to 3.4 per cent in 2013 which are below the African average of 7.4 per cent.

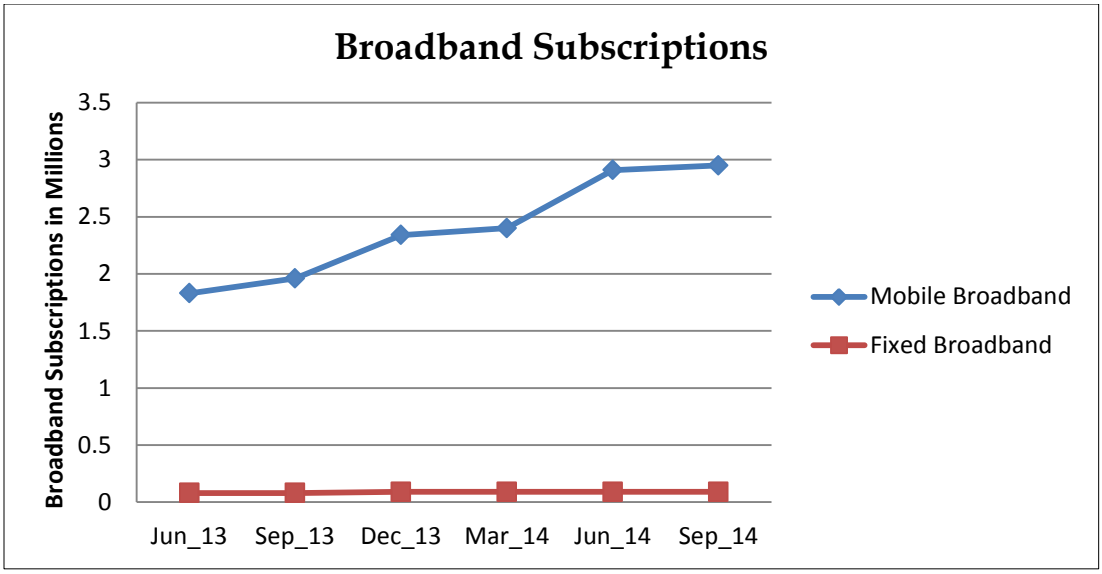

Figure 7: Broadband subscriptions

Source: CA_Sector Statistics Report 2014_2015

2.04 Internet Subscriptions

Internet subscriptions rose from 8.5 million in 2012 to 13.3 million in 2013. During the first quarter of the financial year 2014-2015 under review[6], the total number of data or internet subscriptions grew by 5.8 percent to stand at 14.8 million from 14.0 million subscriptions registered during the previous quarter (June 2014), a growth of 5.8% in three months. The growth in the number of data/internet subscriptions was mainly boosted by mobile data/internet subscriptions that have been on the rise over time. In the quarter being reported (reports taken by September 2014), mobile data/internet subscriptions rose to 14.7 million up from 13.9 million recorded around June 2014.

[6]Communications Authority of Kenya, Sector Statistics Report 2014-2015

Terrestrial wireless subscriptions currently stand at 16,999 subscriptions while satellite subscriptions currently records around 600 subscriptions every quarter of the financial year (about 598 subscriptions in September 2014 period and 646 subscriptions during the June 2014 period). The growth in the number of fiber subscriptions has been gradual over the period 2014, with number of subscribers standing at 70,115. The growth in data/internet subscriptions is indicated in Table 1.

Table 1: Growth in data / Internet subscriptions

Internet/Data Subscriptions	*Sep 2014*	*Jun 2014*	*Quarterly Variation (%)*	*Sep-2013*	*Jun-2013*	*Quarterly Variation (%)*
Total Internet Subscriptions	**14,845,967**	**14,030,036**	**5.8**	**11,671,337**	**12,432,308**	**-6.1**
Mobile Data Subscriptions	14,745,836	13,930,694	5.9	11,580,065	12,340,005	-6.2
Terrestrial Wireless Data	16,999	17,169	-0.1	17,169	21,282	-19.3

Source: CA_Sector Statistics Report 2014_2015

2.05 Percentage of Individuals using the Internet

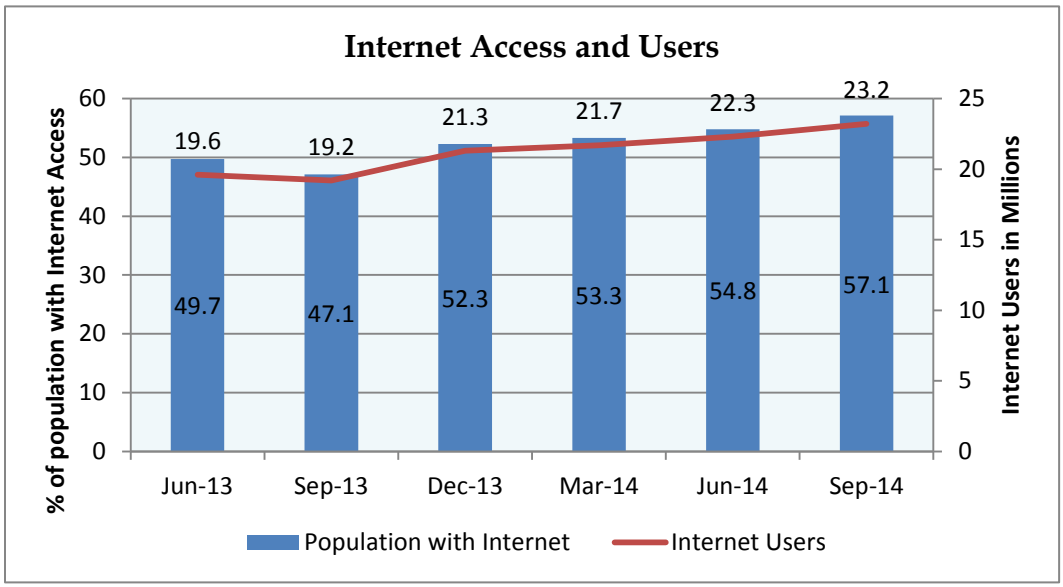

Figure 8: Internet Users and Percentage of individuals with Internet access

Source: CA_Sector Statistics Report 2014_2015

As Figure 8 illustrates, the estimated number of internet users stood at 23.2 million around September2014. This was a rapid increase in subscription levels from the previous 3 months, with 22.3 million recorded internet users in June 2014, representing growth of 4.1 per cent during just one quarter. Certainly, the number of internet users is growing very fast in Kenya. The total population that had access to internet maintained an upward trend to stand at 57.1 per cent in September 2014, up from 54.8 per cent posted in June 2014, marking a growth of 2.3 per cent. It is worth to note that more than half of the Kenyan population currently enjoy some form of internet connection.

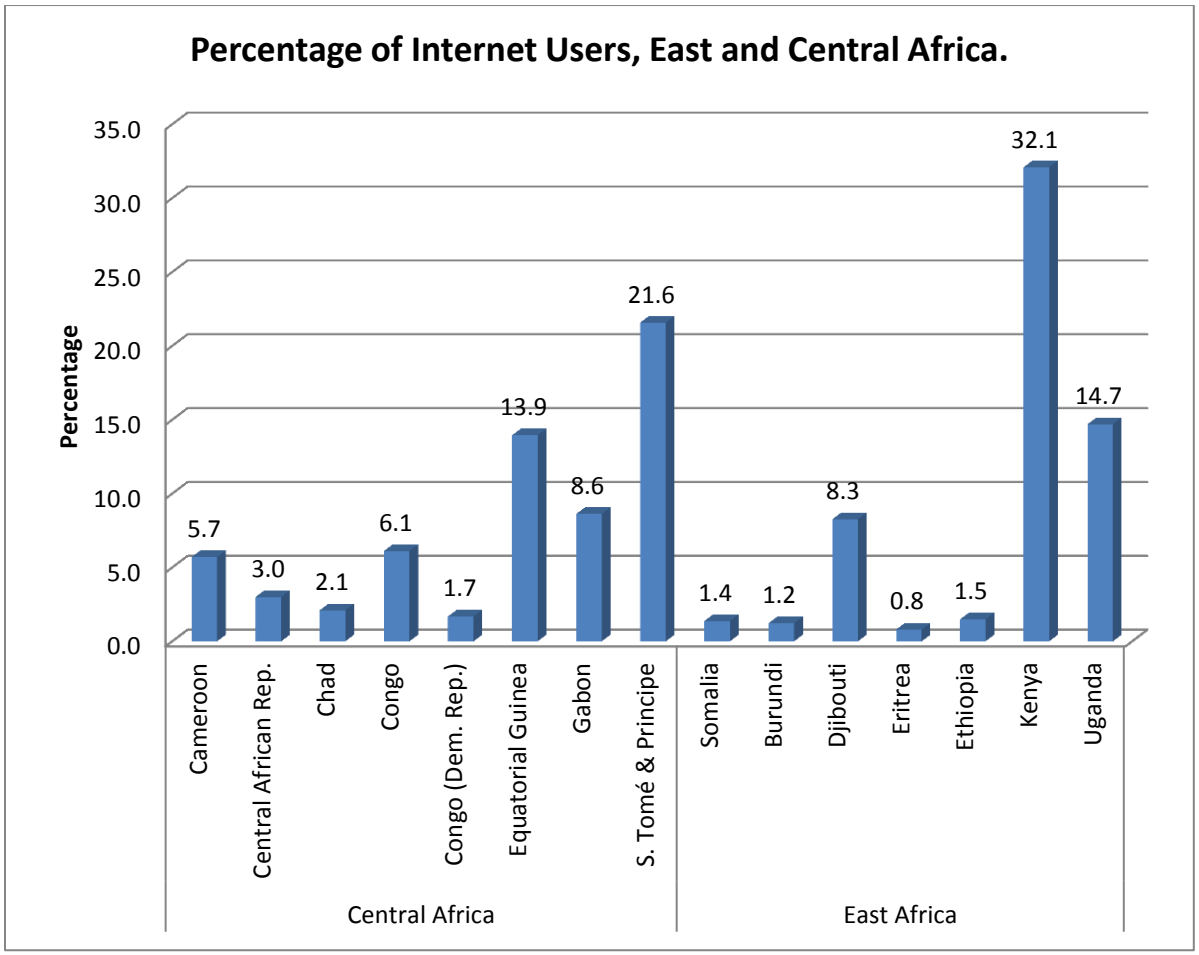

Figure 9: Percentage of individuals using internet in 2012, East and Central African countries

Source: ITU World Telecommunication/ICT Individuals_Internet_2000-2012 Database

3.0 COSTS IMPLICATIONS FOR DIFFERENT MOBILE TECHNOLOGIES

3.01 Cost effectiveness of Mobile Phone Voice (call centre surveys)

The Dar-es-Salaam 2010 study[7] reported the following costs on mobile phone voice interviews via a call centre. The call center contracted to implement the initial 12 survey rounds, did so at a rate of $1,400 per round. Add the cost for consultants to maintain a website, supervise data collection and to analyze the data, the marginal cost per round increased to approximately $2,500. The interview rounds averagely reached 343 respondents, which then implied the cost of interviewing one respondent per interview was about $4.10 - $7.30. Dillon (2009)[8] noted a relatively similar marginal cost per survey: $6.98.

In addition to these marginal costs, one needs to include the cost of a baseline study, which will often be between $50 and $150 per respondent, depending on the complexity of the survey and the distances that have to be covered. Whether this is cost effective or not depends a lot on the purpose of the survey. The ability to carry out an entire survey in Dar es Salaam and to report on its results for $2,500 is remarkably cost effective.

3.02 Cost of IVP, USSD, etc mobile phone surveys

We refer to the Durban study in South Africa (2009)[9]. The researchers established a web-based system that allowed electronic surveys or questionnaires to be designed on a word processor, sent wirelessly to standard entry level mobile phones, and then used in interviews. Given the minimal hardware requirements, an entry level mobile phone

[7] Croke K., Dabalen A., Demombybes G., Giugale M. and Hoogeveen J. Collecting high frequency panel data in Africa using mobile phone interviews. Policy Research Working Paper 6097, 2012, http://econ.worldbank.org

[8] Dillon, Brian (2009). Using Mobile Phones to Conduct Research in Developing Countries.Journal of International Development.

[9] Mark Tomlinson, Wesley Solomon, Yages Singh, Tanya Doherty, Mickey Chopra, PetridaIjumba, Alexander C Tsai and Debra Jackson.The use of mobile phones as a data collection tool: A report from a household survey in South Africa.BMC Medical Informatics and Decision Making 2009, **9**:51 doi:10.1186/1472-6947-9-51

(NOKIA 2626) was used, which was priced at about ZAR400 (US$40) in South Africa at the time of the survey. Surveys were billed per individual question completed. In this survey, the cost per completed survey was US $0.30. However, this was exclusive of data storage, data entry costs, cost of running a website for data dissemination and such associated costs.

3.03 Cost of wired Broadband Connection

In 2008, ITU datasets estimated the following internet tariffs in select African countries. The lowest tariffs were reported for South African countries, such as USD 26.31 in South Africa and USD 29.64 in Botswana.

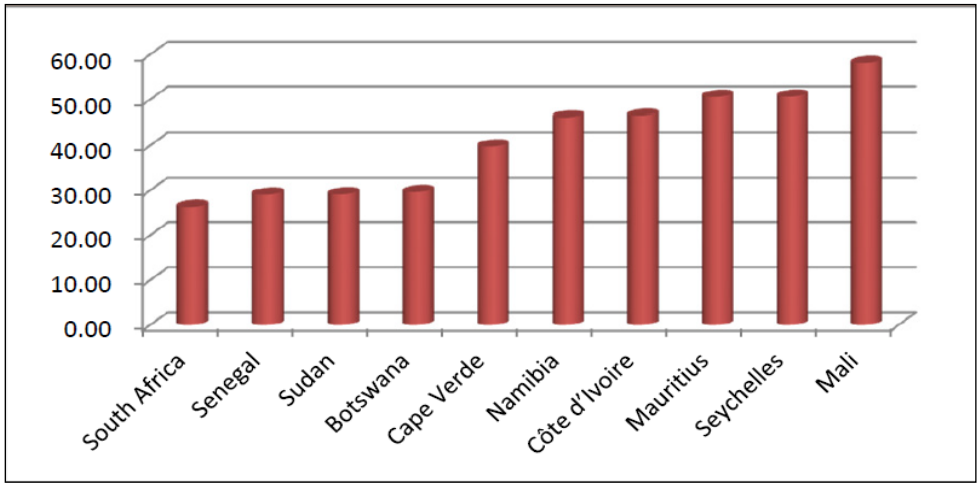

Figure 10: Cost of wired Broadband connection in 2008 in Select African Countries

Source: ITU databases

Some of the best performing West African countries included USD 46.53 in Côte d'Ivoire and USD 58.16 in Mali. The ten highest tariffs, according to these data, ranged from USD 170 in Uganda to over USD 1 000 in Burkina Faso. Nigeria was reported to have relatively poorly developed wired network compared to the mobile sector, while

in Kenya, many customers are cancelling their wired Internet subscription in favor of 3G mobile Internet subscriptions.

These tariffs were applied to leased lines intended mainly for businesses. At that time, wired broadband was not available to households. These tariffs were reportedly very high, even for businesses.[10]

Due to the high cost of phones that can support external applications, such as Java-enabled phones, voice is cheaper than electronic forms, even given the ongoing cost of an operator salary. SMS is the cheapest since it requires no operator and can be used with any phone. Perhaps most important is that the cost for each interfaces is less than $10 in Kenya, and generally in Africa.

3.04 Summary of Cost Analysis

The following rates are estimated for the lowest priced item based on Kenyan market values by 2014 for the said goods and services.

Table 2: Cost of Mobile Data Collection services and goods

Item	Description	Cost in US$
Computer	Laptop	US$ 500 or below
Cell Phone	Java Enabled	US$ 150 or below
	SMS and voice	US$ 25 or below
Cost of making a call	Per minute	US$ 0.05 approx.
SMS	Per SMS	US$ 0.05 approx.
Salary for a phone	One person per	US$ 500

[10]ITU reports. Prepared by Regulatory and Market Environment Division (RME) of the Telecommunication Development Bureau (BDT) and ITU-T Study Group 3. Study on international Internet connectivity in sub-Saharan Africa. March 2013

call operator (call centre)	Month.	
	Per Day	US$ 16.6
Printing questionnaires (non-electronic survey)	Single 20 page questionnaire	US$ 0.25
Cost of Database creation		US$ 2500
PDA	Each	US$ 270
Data Collection, Entry and Cleaning	Per day, per Individual enumerator	US$ 100

Suppose a survey requires that 1000 respondents are to be reached by approximately 100 enumerators. Based on the costs estimated above, we estimate the average cost of the survey using different approaches below.

(a) Pen and Paper Survey

The survey would require 1000 printed questionnaires, each printed at US$ 0.25. Total cost of printing a questionnaire would thus be US$ 250. If each enumerator attends to 10 respondents, data collection would therefore last one day. 100 enumerators each earning US$ 100 per day, would earn a total of US$ 10,000. Database creation cost is approximately US$ 2500. Suppose the enumerators are used to clean and manage data after entry for errors, then that would also cost US$ 100 per enumerator, totaling US$ 10,000. The total cost of survey would thus be US$ 12,750. **This translates to US$ 12.75 per respondent in the survey**.

(b) PDA survey

The initial cost of purchasing the PDAs is what would make the PDA approach expensive. It costs approximately US$250 to buy one PDA. Due the high cost, one

would opt for less than 100 enumerators, for instance 10 enumerators, each visiting 10 respondents and thus working for 10 days. This would imply 10 PDAs for 10 enumerators, totaling US$ 2,500. Together with salary for enumerators pegged at US$ 16.6 per day, 10 enumerators working for 10 days would earn a total of US$ 1660. The other costs such as data creation, management and cleaning are US$ 0 when using PDAs. The total cost is thus US$ 4160, **translating to US$ 4.16 per respondent.** Successive surveys would be much cheaper.

(c) Voice on Phone survey

Suppose the respondents are assumed to have their own phones. The cost of survey would be mainly on the cost of making a phone call and paying the phone operators. The salary of a phone operator per day is estimated to be US$ 17. Multiple by around 2 operators per call centre, making averagely 60 phone calls each per day, hence for approximately 10 days to reach 1000 respondents, the total salary would be US$ 166. The cost of making a phone call is US$ 0.05, multiplied by 1000 respondents, implies US$ 50. Again, assume the Database creation cost is US$ 2500. The total cost is thus US$ 2716 for the whole survey, **translating to $2.716 per respondent.**

If the respondents were to be supplied with phones, especially in countries where mobile subscription numbers are very low, the total cost of acquiring phones would be US$ 25 each, multiplied by 1000 respondents. The total cost of survey would thus be US$ 27716, which also **translates to US$ 27.716 per respondent.**

(d) SMS

SMS and USSD and Electronic forms would cost almost similarly. A single SMS costs $US 0.05. For 1000 respondents, that would cost US$ 50. Other costs would include database creation at US$ 2500 and phones (optional) at US$ 25,000 (US$ 25 each).

Without distribution of phones at the beginning of the study, the total cost of survey would be US$ 2550, **translating to US$ 2.5 per respondent.** If the cost of phones is inclusive, then the total cost per respondent would be US$ 27.55.

4.0 MOBILE DATA COLLECTION PROJECTS INVENTORY FOR KENYA[11]

This data was compiled by MobileActive.org in the period April/May 2010. The authors remarked that the inventory is by no means exhaustive and is a result of voluntary submissions by project coordinators after a public call for projects, and outreach/research by the MobileActive.org staff. To submit a project to the inventory, the following email contact was given: Anoush@mobileactive.org

Table 3: Mobile Data Collection Projects Inventory in Kenya

Project Name	Organization	Country or Region	Website	Data Type/Category	Platform Used	Content of data
Building Bridges Peace Campaign	Butterfly Works, Media Focus on Africa	Kenya	http://buildingbridges.co.ke	Civic - Peace and Conflict, awareness creation, empowerment	ushahidi	mapping description of peace initiatives, time line showing updated initiative over time, information on peace partners per region with contact and support information
Kenya Community Development Fund program	MC Labs	Kenya	www.mclabs.it	Quality of Life/Community Conditions - impact of projects on community	rapidSMS	Farm Harvest Statistics, Farm Sales Statistics, Tree Planting Initiatives,Arts& Culture Events, Youth Meetings Organised,Girls rescued from FGM

[11] *UN Global Pulse 2010 report*

monitoring						
USAID - AMPATH	USAID The Home-based Counseling and Testing project (HCT)	Kenya - A large geographic region centered on AMPATH's location in Eldoret, Kenya http://www.iukenya.org/map.html.	http://www.medicine.iupui.edu/kenya/index.html	Health	ODK	HCT travels to each home in Kenya and attempts to ascertain the HIV status of all people therein. Basic demographics are also collected, as well as the GPS location of the home and any risk factors that may warrant immediate attention.
KickStart (Gates Funded)	Synovate	Kenya & Tanzania	www.synovate.com	Agriculture	Custom	Pump awareness, experiences and impact.
Map Kibera	GroundTruth	Kibera, Nairobi, Kenya	http://groundtruth.media.mit.edu/	Mapping	Open street Map	base map layer as well as health service, securitz, informal schools and water/sanitation points (using GPS) layered on top with narrative/anecdotal

						data on community opinions using tracing paper and new media (flip cam, blog, radio).
Text to Change sms quizzes	Text to Change	Uganda, Kenya	www.texttochange.com	Health	Text to Change will start to work with a changed version of RapidSMS)	Age, gender, location, income level, knowledge on health topic, marital status.

Source: Mobile Data Collection Inventory, UN Global Pulse, 2010 and Mobile Active Organization (Anoush@mobileactive.org)

5.0 KENYA NATIONAL BUREAU (KNBS) CAPI EXPERIENCE

In survey/census/data processing, mobile technology is slowly transforming the way data has been captured into a computer system. By integrating mobile devices with function-tailored data capture capabilities, one can dramatically improve the data capture process.

In the past, all censuses/survey data collection was paper based at KNBS until very recent. Advancement in technology is transforming data collection from PAPI to CAPI. Although it is not widely used method but few surveys have been conducted using CAPI.

KNBS undertakes routine and ad hoc surveys, survey instruments used for routing survey are simpler in comparison to ad hoc. The complexity of the survey has acted as key factor to make choices on technology usage in data collection (whether PAPI or CAPI). CAPI technology is not fully implemented at KNBS and only a few surveys depending on simplicity of the questionnaire, have used that technology in data collection. The bulk of surveys are still using the traditional methods (PAPI).

Some of the surveys undertaken using mobile technology include:

- *National Sample Survey and Evaluation Program (NASSEP IV*),
- *Global Adult Tobacco Survey (GATS 2014),*
- *National Housing survey (NHS 2010) and*
- *Kenya Aids Indicator survey (KAIS 2012).*

KNBS staff developed CAPI data capture systems for all those surveys except KAIS 2012. In the rest of the surveys, the development team use CSpro software

to program the CAPI system a freeware from by US Bureau of Census. KAIS was developed by NASCOP using visual Studio.NET platform.

When Survey tools are completed, the tool is handed over to the CAPI developers for screen design and development. Training of the enumerators on CAPI usage takes place when the CAPI system is completed and thorough testing is done. After thorough testing of the system, the system is piloted and any amendments made to the questionnaire and detected bugs are fixed before the main data collection. Setting up the system in the mobile devices is done, and the teams are ready for data collection.

5.01 Challenges in CAPI implementation at KNBS

- It's often the case that there is no sufficient time to test the devices due to project timelines. It's often necessary to conduct updating of the system during the first month of data collection. Keeping track of the CAPI system versions is very necessary when the software is updated. This enables reformatting the data because of the new changes. Updating CAPI system to new versions need be done systematically otherwise enumerators will be using different versions of the system and there will data mismatch.
- Sometimes enumerators loose data due to mishandling of devices and at times the system stops working interrupting data entry process. It happens for those who did not master the training on use of the device. Devices breakdown in the process and reserve devices are often required for replacements and migrating the data from a defective device. Technicians and programmers are ever moving round to resolve such issues.
- Some areas of data collection often have no internet coverage and data cannot be transmitted. CAPI system is created in two different modes; the offline and

online mode. It makes it possible to store the data in a local device and synchronize the data when internet is back / available. Sharing of the data by enumerators and the supervisor is done through local area network established via the device Bluetooth. Supervisors are tasked with data transmission to a central server at the KNBS headquarters through a FTP or Drop box

- Data collection using mobile devices is not common in Kenya and respondents' attention is diverted concentrating more on the device rather than answering the questions. If care is not taken more time is spent with one respondent.
- Small size of device display inconveniences the enumerator especially when the questionnaire is complex and only few questions can be displayed at a time. Screen resolution could hamper the data collection especially when the interview is done in a place where there no shade. Questions are not very visible and enumerators would strain.
- Few cases of device theft are reported and especially in urban areas.

5.02 Advantages of CAPI methods by KNBS experience

- The overall cost of conducting the survey is reduced, this is attributed to very minimal printing done, transportation cost is reduced due to data is transmission via the web and no hiring of warehouses for questionnaire storage.
- Quality of data improves since errors detection tools are in-build in the CAPI system and manual editing is not required.
- Sharing of information by field staff with data managers at headquarters for validation and data quality analysis is done via the web.
- Data collection errors are drastically reduced since CAPI combines both data collection and data entry, eliminating paper collection errors hence improving data quality.

- Data validating is done by system inbuilt procedure to ensure proper values are entered and that there is no missing or incomplete information and data stored in ASCII format.
- User-Friendly Interface: User friendly interface is made easy to navigate and highlight required fields to ensure all mandatory fields are completed.

6.0 DATA DISSEMINATION[12]

Mobile technology also finds relevance to data dissemination especially with the widespread availability of internet connection. There are attempts within KNBS to enhance data dissemination, especially through their collaboration with Strathmore University through @iLabAfrica. The project launched the Data and Visualization portal which will help make available data and visualizations of key publications specifically: The 2009 Census Report, Economic Survey Report (2001−2014), GDP Report (2001−2014), and select County Statistical data[13].

Data may be made available in digital form which can be accessed via internet using any mobile devices such as phones, computers, and tablets, among others. Some of the commonly used platforms for data dissemination currently used especially by KNBS include:

KNBS Data Visualization Tool

The initiative implements the concept of Open Data whose prime objective is to get the right information to the people who need or want it, in a form that allows them to use it.

[12] Data dissemination tools by Kenya National Bureau of Statistics: *www.knbs.or.ke*
[13] http://www.strathmore.edu/en/media-center/426/54/KNBS-iLabAfrica-launch-Data-and-Visualization-portal

Kenya National Data Archive (KeNADA)

It provides methods to organize, store and display data and Reports in a uniform way to facilitate data sharing at the country level across the world.

Kenya Data Portal

This portal provides an online access to various data, information, and publications from the Kenya database. ***Data search*** module provides a user-friendly and efficient tool to search for any indicator data in any data source of the portal. ***The Map*** page enables one to visualize any indicator on an interactive map of Kenya. ***Dash board*** module provides a snapshot of preselected indicators with live dashboards that enable you to choose different indicators, regions, and years. ***Data Analysis*** module uses OLAP technology, an efficient analytical tool for performing multidimensional queries on various data sets, with results exportable to external formats. ***Bulk Download*** tool enables you to export data to TXT, CSV, XLS, MDB, and DBF formats for further use in different statistical applications. ***Documents*** module provides access to a library of numerous Kenya publications.

Kenya Socio-Economic Database (KenInfo)

This software provides methods to organize, store and display data in a uniform way to facilitate data sharing at the country level across government departments, UN agencies, development partners and other interested parties. The software has simple and user-friendly features that produce tables, graphs and maps for inclusion in reports, presentations and advocacy materials. KenInfo has 206 indicators grouped into sectors namely; Communication, Demography, Economic growth, Economy, Education, Environment, Equity and Poverty Reduction, Governance, Health, Information and Communication, Nutrition, Protection and Women. These indicators are also classified

into global and local Millennium Development Goals (MDGS), the Economic Recovery Strategy (ERS) goals and Kenya Vision 2030 economic development plan as well as sector specific performance indicators. It contains data for 123 time periods (standard years, year ranges & quarters) from 1962 to 2009

The Integrated Multi-Sectoral Information System

The Integrated Multi-sectoral Information System (IMIS) is a user friendly system that allows the user to define his or her own indicators. It contains data both at atomic (micro) and aggregated levels.

Indicators derived from the system are useful for planning and monitoring of government programs including Millennium Development Goals (MDGs) and the attainment of Kenya Vision 2030 goals.

Currently, there are eleven (11) datasets in the system and more will continuously be uploaded.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Unlike the sky rocketing growth of mobile telephony, computer availability and internet subscription in Kenya, other telecommunication market segments such as the wired network telephone services and the internet usage are not experiencing faster growth as compared to the mobile phone sector. The wired network telephone service is under-developed in the country. Fixed telephone subscriptions have been declining from the period 2009-2013. Growth in the number of wire-lines (landline) subscribers is low and investment in this network has slowed down in recent years. In Kenya, land lines are being abandoned in favor of mobile links.

The situation on internet usage is improving but not yet getting better, as the number of internet users is still very low and high tariffs are being charged despite the low purchasing power of low-income populations if measured by the minimum wage. Therefore Mobile technology and even ``Mobile Internet" has turned out to be very popular today because the mobile network coverage is already higher than 50% among the entire Kenyan population. It is therefore recommended that Kenya has the basic minimum capacity to use mobile technologies to collect and disseminate data for effective policy and decision making.

Through the pilot project, Kenya will strengthen its capacity and make improvements particularly through sensitizing researchers and data collection stakeholders to embrace the concept of using mobile technology in their day today data collection exercises. This would improve the availability of cleaner, more efficiently collected and more accessible data that would go a long way in improving our capacity to conduct proper development policies and enhance economic and other sector development.

Through the pilot project, Kenya as a country should also develop and enhance policies that would make the mobile technology gadgets very accessible to most of its

populations. Furthermore, the country will need to enhance internet availability through mobile technology by reducing tariffs and rates charged on internet connection services. Once the availability of internet and mobile technology availability is enhanced, the country should be on its way to having the right capacity for data collection entirely by mobile devices.

Over and above the general infrastructure needed for use of mobile technology in data collection, the pilot project is meant to enhance human capacity in the ICT sector that would spearhead software development, quality data collection and data analysis.

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