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## Conference Paper

# Predictors of mobile internet usage in 10 African countries

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# **The 19th ITS Biennial Conference 2012**

## **“Moving Forward with Future Technologies: Opening a Platform for All”**

18 - 21 November 2012, Thailand

### **Predictors of mobile Internet usage in 10 African countries**

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## Predictors of mobile Internet usage in 10 African countries

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### Short biographies

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**Rong Wang** is a doctoral student at Annenberg School of Communication, University of Southern California (USC). She received her B.A. in journalism from Nanjing University (P.R. China), and her Master's from Communications and New Media Program at National University of Singapore. Before joining USC as an Annenberg research fellow, she worked at the International Development Research Centre (IDRC) with Information and Networks Program, based in Ottawa, Canada.

### Abstract

Mobile phones and Internet use can enable human capabilities that can contribute to positive developmental outcomes (Smith, Spencer, & Rashid, 2011; Ndung'u & Waema, 2011; Agüero, de Silva & Kang, 2011; Sen, 1999). Communication networks, in Africa particularly mobile phones, have been recognised as an important component for social mobilisation (Castells, 2009). Reports have focused on the role of mobile phones in organising social protests and political mobilization (Comninos, 2011) such as the food protest in Mozambique in 2007/08, and violent ethnic mobilisation in Kenya in 2009 and around the world. Further, since the Arab Spring, the use of the mobile phone for social mobilization has become an increasing focus of research. As part of this research which seeks to explore the role of ICTs in contemporary social and political engagement, this paper presents an empirical assessment of predominant social and demographic factors that are predictors of mobile Internet usage. It is based on nationally representative ICT household survey data collected by Research ICT Africa in 2011 and 2012 across 10 African countries.

This study draws on previous studies on technology adoption, and tests on the effect of social factors and demographic variables on mobile Internet usage. Also, it presents descriptive data on network exposure. It poses the following research questions: what are the social aspects and demographic factors influencing mobile Internet usage in selected African countries? To what extent does belonging to specific civic affiliations such as religious, recreational or political groups impact on mobile Internet usage?

The odd of using mobile Internet is assessed against demographic factors such as age, gender, income and level of education, among others. The impact of mobile Internet usage for social mobilisation is evaluated against belonging to specific social affiliations such as religious, recreational or political organisations. Other predictors include affiliation with certain social groups and the closeness of the local community. Network exposure was measured in the ICT household surveys, by asking respondents to list how many people out of their top five contacts are users of mobile phones and social network sites. Further, the analysis includes also an assessment of whether the use of the mobile phone increased or decreased contacts with specific social groups. What activities users got involved in through the mobile are also included into the analysis.

The study concludes with policy implications on mobile Internet usage in African countries in particular related to democracy, empowerment and capability development. Furthermore, since it

investigates whether mobile Internet usage enhances contacts with different social groups such as family, friends, religious or political groups, this study seeks to assess the potential of the technology to mobilise different networks in selected African countries.

### **Keywords**

ICT indicators, Access, Mobile Internet, Social Media, ICT Household Survey, ICTD

## INTRODUCTION

Social and economic implications of mobile Internet access and usage in developing markets is an emerging policy research area. Studies on Information and Communication Technologies (ICT) policy and regulation have focused mostly on the benefits associated to increased connectivity through the mobile phone, while little is known about the usage that has been done through mobile Internet (Donner et al., 2011). Although an expected growth of mobile Internet users also at the Bottom of the Pyramid<sup>1</sup>, knowledge gaps on how mobile Internet has been used in particular by resource-constrained individuals does not allow to further develop the theory, policy, and design of ICT for development (ICTD) programmes and projects (Donner et al., 2011).

Uneven disaggregated data on mobile Internet usage in Africa at a national level are available from service providers. For instance, the micro-browsing service provider Opera released data on usage of its mobile application the Opera browser, claiming that the mobile web will soon outstrip the PC web (Opera software, 2011). Social media web site such as facebook and youtube are among the top 10 sites which received the highest number of unique users in countries like South Africa, Nigeria and Egypt (Opera software, 2011). Social media have been identified as an important driver for mobile Internet adoption in African countries, for instance in Kenya by recent qualitative studies based on focus groups on mobile Internet usage and demand (Souther, 2011). Associated with the rapid growth of mobile connectivity, Ovum (2012) expects that also the consumption of mobile entertainment services such as music, gaming, and video will be growing in developing countries.

From a perspective related to democracy and empowerment in developing countries, analysing social and demographic predictors of the mobile Internet has emerged as a relevant policy research area. Assessing not only physical access and affordability of the mobile Internet but also the social dimension of the usage of this technology, and the effects that its infrastructure and content regulation has been imposing on citizens empowerment, Internet governance and democracy, has become a relevant issue of ICT policy research particularly after the recent events in the Middle East and Northern Africa (MENA) region.

Reports document on how mobile phones, social media and mobile Internet in particular has been used as a tool for social mobilisation during uprisings and protests in the MENA region, and on how governments reacted by virtually shutting down access to the Internet and to the mobile phone network<sup>2</sup>. In addition to network shut down during riots, in Tunisia the government has censored not only explicitly political content, but also social media sites such as the video-sharing website Dailymotion since 2005 (Zuckerman, 2011).

Major theories of sociology of communications emphasize different approaches to public and political participation in the media sphere. According to Habermas (1962) political participation is at the core of a democratic society and it is an essential element in individual self-development. However, his studies demonstrated that elites such as governments and private corporations, through controlling the media, control the public sphere, and therefore the political debate, the society and individuals. However, today, the borders of private or public ownership and content regulation of the Internet are blurring. With the expected growth of connectivity to the Internet in emerging economies, although still marginal and through the mobile phone, a new public sphere is emerging in the African society in the digital world of the Internet, of social media and of mobile phones. Therefore, it is possible to assume that infrastructure and content regulation of the mobile web by the public and the private sector will have effects on the political debate, the society and individuals. Economic, legal and policy decisions are shaping the Internet as it becomes institutionalised and the social implications of the Internet depend on those (DiMaggio et al., 2001).

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<sup>1</sup> Bottom of the pyramid is the portion of the population with an income adjusted at a household level of 2.5 USD PPP per day, or 75 USD PPP per month.

<sup>2</sup> Comminos (2011) reports on how user generated content published in social media has been used by governments to crack down on protesters in the MENA region (Comminos, 2011). Similarly, in September 2010 the government of Mozambique banned SMS service as a response to riots and protests for food price increase and in 2008 the Kenyan government requested the main mobile service provider Safaricom to switch off the SMS messaging system during the election period (allAfrica.com, 2010, Southwood, 2010).

Other studies suggesting to consider also social dimensions of improved mobile Internet access, usage and content, explore new approaches to digital divide. Hatem Ali (2011) approach to the digital divide encompasses more than just physical access to ICTs, and investigates also how and what for ICTs, and Internet in particular, are being used. He argues that as a legacy of measuring connectivity and access to telephony that had only a single use, indicators measure the digital divide only in terms of physical access to infrastructure - for instance, ownership of a phone, number of telephony lines. However, he asserts that the Internet has different possible uses, such as communication, education, commerce, social and professional networking, etc. Therefore, in the context of the Internet, studies investigating social usage of the Internet should take into account, and make a distinction between, physical access to the infrastructure and actual use of the Internet. In particular, making a distinction between access and use of the Internet clarifies the goal of policies aimed at closing the digital divide. These should include not only an equal distribution of physical access to the infrastructure, but also equality in terms of full participation and inclusion of the poor, even if they lack the financial resources (Hatem Ali, 2011).

Due to its specific characteristics, social media applications provide a simple channel of communications empowering people to publish their own content and to share with their community what is relevant for them, in their local language, removing the limiting one-to-many centralised approach of broadcasting information or the restricted one-to-one communication in the form of text messages or emails. Moreover, mobile social media applications lower ICT skills requirements, requiring less technical training to learn compared to computers.

Linguistic barriers have represented a major obstacle to Internet adoption in developing countries. However, blogging and social networking applications have been solving the technical challenges behind the language barrier and can support any language. The content is available for free and may be communicated in local languages. Lastly, social media has the capacity to foster participation and democratisation, since it shifts the role of users from passive receivers of information to active participants in public debates.

The role that social media played in the MENA uprisings, which according to Hatem Ali (2011) brought to the people a sense of self-empowerment through improving their capacity of speaking and assemble, requires to think critically and broadly about the role that social media can and should play in developing nations. A better estimation of the number of mobile Internet users and how users use social media and produce user generated content could assist policy makers concern with the potential of mobile web for empowerment and social development.

## RESEARCH METHODOLOGY

Demand-side ICT indicators have been collected in 2011/2012 through the Research ICT Africa ICT access & usage survey, which delivers nationally representative results for households and individuals. The survey uses Enumerator Areas (EA) of the national census sample frames as primary sampling units and sampling households from created listings for each EA. The random sampling was performed in four steps for households and five steps for individuals.

Step 1: The national census sample frames was split into urban and rural Enumerator areas (EAs).

Step 2: EAs were sampled for each stratum using probability proportional to size (PPS).

Step 3: For each EA a listing was compiled, serving as sample frame for the simple random sections.

Step 4: 24 Households were sampled using simple random samples for each selected EA.

Step 5: From all household members 15 years or older or visitor staying the night at the house, one was randomly selected based on simple random sampling.

The desired level of accuracy for the survey was set to a confidence level of 95% and an absolute precision (relative margin of error) of 5%. The population proportion P was set conservatively to 0.5 which yields the largest sample size (Lwanga & Lemeshow, 1991). The minimum sample size was determined by the following equation (Rea & Parker, 1997):

$$n = \left( \frac{Z_{\alpha} \sqrt{p(1-p)}}{C_p} \right)^2 = \left( \frac{1.96 \sqrt{0.5(1-0.5)}}{0.05} \right)^2 = 384$$

Inserting the parameters for the survey yields the minimum sample size for simple random sampling. Due to the sampling method chosen for the survey the minimum sample size has to be multiplied by the design effect variable (Lwanga & Lemeshow, 1991). In the absence of empirical data from previous surveys that would have suggested a different value, the default value of two was chosen for the design effect (UNSD, 2005). This yields then a minimum sample size of 768 for households and individuals. The actual sample size is slightly larger than the minimum requirement to compensate for clustering effects and to have a wide enough spread of EAs throughout a country.

Logistic regression was used to test two models. The first model was to predict Internet browsing on mobile phones, using civic, religious and political associations and demographics as independent variables. The second model was to predict social media use on mobile phones, in which the same predictors analysed in the first model were also used as independent variables. The  $\alpha$  was set at .05.

To test what factors influence individual's social media usage through mobile phones, we have included two categories of independent variables. The first set of variables which were used as control variables are demographics, including gender, age, highest education received, the total years in school, status in the household, marriage status, student status, being employed or not, and monthly disposable income. The other set of variables are civic associations which were measured by asking the respondents if they belong to the following social groups: religious groups, trade unions, organized political or cultural groups, farmers associations or cooperatives, saving clubs or other micro finance groups, other recreational networks based on common interests, and decision making groups.

Descriptive findings were presented in terms of share of mobile ownership and Internet-enabled phones, network exposure to mobile phones, usage of mobile phone, and effects of mobile use on different social networks. The findings from the two models were also presented to better understand what factors predict mobile Internet use.

### ASSESSING MOBILE INTERNET USAGE

Except in Tanzania, Ethiopia and Rwanda, individual mobile phone ownership in the selected African countries is higher than 40% threshold critical mass in voice networks<sup>3</sup>, which is believed to trigger the network effects associated with economic growth (Röller and Waverman, 2001).

	Uganda	Tanzania	Rwanda	Ethiopia	Ghana	Cameroon	Nigeria	Namibia	South Africa	Botswana
Do you own a mobile phone?	<b>46,7%</b>	35,8%	24,4%	18,3%	<b>59,5%</b>	<b>44,5%</b>	<b>66,4%</b>	<b>56,1%</b>	<b>84,2%</b>	<b>80,0%</b>
Is your mobile phone capable of browsing the Internet?	14,9%	19,2%	19,1%	6,5%	<b>28,5%</b>	14,9%	22,7%	<b>30,7%</b>	<b>51,0%</b>	<b>29,5%</b>

Not only mobile phone ownership is increasing, but also the number of Internet-enabled mobile devices is growing across the population. More than one third of mobile owners in Ghana, Namibia and Botswana own a device capable of browsing the Internet, and more than 50% of South African mobile owners could browse the web through a mobile phone.

<sup>3</sup> However, since 2007/08, mobile phone ownership grew by 288% points in Rwanda, by 493,75% points in Ethiopia and by 66,14% in Tanzania.

In all the countries under investigation except Rwanda, Ethiopia and Cameroon, network exposure through the mobile phone has been found high. In countries such as South Africa and Botswana, according to about 60% of interviewees their close circles of friends have a mobile phone. Compared to the other countries analysed, South Africa and Botswana have also the highest level of mobile ownership which is above 74%. On the contrary, in countries either with a very low GDP per capita such as Rwanda<sup>4</sup> or where the telecommunications market is a monopoly such as in Ethiopia the level of network exposure through the mobile phone is lower, since the majority of respondents in these countries declared that nobody among their closest friends have a mobile phone.

		Uganda	Tanzania	Rwanda	Ethiopia	Ghana	Cameroon	Nigeria	Namibia	South Africa	Botswana
Thinking about your 5 closest friends, how many of them have a mobile phone	0	14,1%	26,6%	<b>35,4%</b>	<b>59,1%</b>	16,2%	<b>38,0%</b>	24,9%	9,5%	9,0%	10,7%
	1	14,1%	12,7%	14,2%	11,9%	7,3%	6,3%	4,5%	8,3%	6,3%	3,1%
	2	16,0%	13,7%	17,3%	9,5%	9,7%	11,0%	7,7%	9,8%	11,1%	7,5%
	3	14,7%	14,5%	11,9%	8,9%	10,7%	6,6%	11,2%	14,6%	9,3%	10,3%
	4	11,1%	4,9%	7,7%	2,4%	7,7%	3,4%	12,0%	5,7%	6,5%	5,4%
	5	30,0%	27,6%	13,6%	8,3%	48,4%	34,8%	39,7%	52,1%	<b>57,7%</b>	<b>63,0%</b>

		Uganda	Tanzania	Rwanda	Ethiopia	Ghana	Cameroon	Nigeria	Namibia	South Africa	Botswana
Thinking about your 5 closest friends, how many of them use a online social network	0	89,4%	94,1%	89,7%	98,2%	77,0%	78,8%	73,1%	75,6%	58,9%	62,4%
	1	<b>4,9%</b>	1,4%	<b>3,7%</b>	0,5%	4,9%	4,5%	<b>6,7%</b>	4,9%	6,2%	3,5%
	2	2,9%	<b>1,9%</b>	3,1%	0,5%	3,7%	5,5%	5,3%	4,5%	7,7%	7,9%
	3	1,5%	0,6%	1,5%	0,4%	4,4%	4,3%	5,8%	3,4%	5,3%	5,7%
	4	0,3%	0,1%	0,4%	0,1%	3,4%	0,6%	2,8%	1,8%	2,9%	2,1%
	5	1,1%	<b>1,9%</b>	1,6%	0,3%	<b>6,6%</b>	<b>6,3%</b>	6,3%	<b>9,8%</b>	<b>19,0%</b>	<b>18,3%</b>

Table 3 above shows that the level of network exposure to social media is generally lower than the level of network exposure to the mobile phone, since in all the countries under investigation, the majority of respondents perceived that nobody of all their closest friends use social networking. However, a significant degree of network exposure to social media was identified in South Africa and Botswana, where for almost 20% of the population investigated their five closest friends were using social networks. In Ghana, Cameroon, Nigeria and Namibia between 6% and 10% of the population surveyed had their five closest friends using social media.

		Uganda	Tanzania	Rwanda	Ethiopia	Ghana	Cameroon	Nigeria	Namibia	South Africa	Botswana
What are you using your mobile phone for?	Making and receiving phone calls	100%	99%	100%	100%	99%	100%	99%	100%	99%	100%
	Sending and receiving text messages (SMS)	85%	92%	92%	49%	61%	89%	79%	98%	96%	95%
	Skype / Voice over IP	2%	10%	2%	3%	3%	3%	2%	7%	3%	6%

<sup>4</sup> Rwanda GDP pp in 2011 (est.) was USD 1.400,00 (source: CIA - The World Factbook).



	Taking photos or video clips	19%	21%	24%	27%	39%	41%	43%	26%	55%	36%
	Facebook, Twitter, Mixit or other social networking	7%	5%	14%	2%	11%	8%	<b>16%</b>	<b>17%</b>	<b>25%</b>	<b>18%</b>
	Browsing the Internet	8%	5%	15%	5%	13%	8%	<b>16%</b>	<b>24%</b>	<b>28%</b>	<b>23%</b>
	Downloaded applications to your mobile phone	10%	3%	6%	1%	12%	18%	15%	12%	22%	14%
	Reading and writing Emails	6%	5%	13%	10%	9%	4%	15%	12%	17%	17%

In addition to traditional mobile phone uses, such as making and receiving calls and SMS, an interesting usage trend which has been identified was using the mobile for social networking and browsing the Internet across most of the countries surveyed. As expected, this trend is particularly evident in countries with a higher level of mobile ownership and with a higher penetration of Internet-enabled mobiles such as Rwanda, Ghana, Nigeria, Namibia, South Africa and Botswana. Further, in all the countries under investigation more than 20% of mobile owners have used their phones for taking pictures or video clips, which can be done on feature or smart phones, and therefore on Internet-enabled devices<sup>5</sup>.

Table 5: Does your use of the mobile phone increase or decrease your contact with the follow groups?

		Uganda	Tanzania	Rwanda	Ethiopia	Ghana	Cameroon	Nigeria	Namibia	South Africa	Botswana
People who share your hobbies/sports	decrease	9,3%	10,7%	20,3%	1,6%	4,0%	11,3%	7,1%	3,3%	7,8%	4,2%
	the same	37,6%	<b>52,7%</b>	<b>46,1%</b>	32,3%	<b>64,5%</b>	42,8%	41,5%	41,0%	<b>56,4%</b>	44,2%
	increase	<b>53,1%</b>	36,6%	33,6%	<b>66,0%</b>	31,6%	<b>45,9%</b>	<b>51,4%</b>	<b>55,7%</b>	35,8%	<b>51,6%</b>
People who share your political views	decrease	12,2%	11,9%	18,9%	5,9%	11,6%	23,0%	15,7%	5,1%	15,4%	12,6%
	the same	<b>55,4%</b>	<b>67,0%</b>	<b>54,9%</b>	<b>77,3%</b>	<b>68,5%</b>	<b>58,0%</b>	<b>41,6%</b>	<b>68,8%</b>	<b>69,0%</b>	<b>60,4%</b>
	increase	32,3%	21,1%	26,2%	16,8%	19,9%	19,0%	<b>42,7%</b>	26,1%	15,7%	27,0%
People who share your religious beliefs	decrease	5,9%	4,7%	16,6%	3,1%	3,4%	5,5%	6,3%	3,0%	9,0%	6,0%
	the same	40,2%	45,5%	<b>45,0%</b>	<b>49,7%</b>	<b>52,3%</b>	44,6%	31,3%	<b>60,6%</b>	<b>54,8%</b>	46,3%
	increase	<b>53,9%</b>	<b>49,8%</b>	38,4%	47,2%	44,3%	<b>49,9%</b>	<b>62,4%</b>	36,4%	36,2%	<b>47,6%</b>
Family & Friends	decrease	2,1%	1,4%	11,2%	4,2%	2,0%	2,6%	4,3%	0,3%	3,1%	2,4%
	the same	7,6%	24,1%	9,3%	15,0%	29,5%	15,4%	17,4%	22,5%	28,4%	22,6%
	increase	<b>90,3%</b>	<b>74,5%</b>	<b>79,5%</b>	<b>80,8%</b>	<b>68,5%</b>	<b>82,0%</b>	<b>78,3%</b>	<b>77,2%</b>	<b>68,5%</b>	<b>75,0%</b>

<sup>5</sup> These percentages are higher than the share of mobile owners with a device capable of browsing the Internet (see table 1). It might be due to the fact that many mobile owners are not aware of owning an Internet-enabled device.

Colleagues	decrease	11,9%	2,4%	25,0%	2,6%	4,0%	14,6%	6,0%	5,9%	6,8%	4,2%
	the same	16,9%	35,3%	15,6%	42,5%	39,0%	32,0%	28,5%	46,9%	42,3%	32,8%
	increase	<b>71,2%</b>	<b>62,2%</b>	<b>59,4%</b>	<b>54,9%</b>	<b>57,0%</b>	<b>53,4%</b>	<b>65,5%</b>	<b>47,2%</b>	<b>50,8%</b>	<b>62,9%</b>

From table 5 above it is possible to observe that the mobile phone has been recognised by respondents as a means which increases contacts in particular with family and friends in all the countries surveyed. Further, respondents perceived that the mobile phone increases contacts also with colleagues, although the improved connectedness with this group is lower than with family and friends. In most of the countries surveyed such as in Uganda, Tanzania, Cameroon, Nigeria and Botswana, for approximately more than a half of respondents the mobile phone increases contacts also with people sharing religious beliefs. On the contrary, the majority of the population under investigation perceived that using the mobile phone has not increased contacts with people sharing the same political views. However, in all the countries surveyed except Cameroon, there were more mobile owners perceiving that using the mobile phone increased contacts with people sharing the same political views than more mobile owners perceiving the contrary.

		Uganda	Tanzania	Rwanda	Ethiopia	Ghana	Cameroon	Nigeria	Namibia	South Africa	Botswana
I use my phone more for business than for social calls	Do not agree	<b>45%</b>	<b>55%</b>	<b>55%</b>	<b>58%</b>	<b>51%</b>	<b>47%</b>	<b>38%</b>	<b>57%</b>	<b>77%</b>	<b>70%</b>
	Not sure	14%	13%	29%	6%	20%	15%	27%	13%	6%	9%
	Agree	42%	31%	16%	35%	29%	38%	35%	30%	18%	20%
I use my mobile phone to check on the safety of my loved ones and see where they are	Do not agree	14%	8%	19%	4%	11%	17%	13%	7%	5%	8%
	Not sure	5%	6%	14%	2%	3%	15%	10%	5%	3%	3%
	Agree	<b>82%</b>	<b>86%</b>	<b>66%</b>	<b>95%</b>	<b>85%</b>	<b>68%</b>	<b>77%</b>	<b>88%</b>	<b>92%</b>	<b>89%</b>
I use my mobile phone to find out about safety issues and to alert people	Do not agree	28%	22%	<b>45%</b>	43%	28%	37%	20%	19%	35%	38%
	Not sure	18%	18%	27%	4%	16%	23%	18%	11%	7%	12%
	Agree	<b>54%</b>	<b>60%</b>	28%	<b>53%</b>	<b>56%</b>	<b>40%</b>	<b>62%</b>	<b>70%</b>	<b>58%</b>	<b>49%</b>
I use my mobile phone to mobilise the community or for political events	Do not agree	<b>58%</b>	<b>63%</b>	<b>77%</b>	<b>89%</b>	<b>75%</b>	<b>78%</b>	<b>49%</b>	<b>46%</b>	<b>84%</b>	<b>79%</b>
	Not sure	20%	15%	11%	4%	16%	14%	23%	18%	6%	10%
	Agree	<b>22%</b>	<b>22%</b>	12%	7%	9%	8%	<b>28%</b>	<b>36%</b>	9%	11%

With regards to usage patterns of the mobile phone, data from table 6 above reveals that the majority of mobile owners use their phones for social activities rather than for business calls. Similarly, from the same table it is possible to observe that the African population rely on the phone for security and safety reasons, since for the majority of mobile owners the mobile phone has been used for safety purposes and to alert people. On the contrary, it does not seem significant the number of mobile owners who has

used the phone to mobilise the community or for political events except in Uganda, Tanzania, Nigeria and Namibia, where the percentage of mobile owners using their phones for social mobilisation was between 22% and 36%.

### WHAT FACTORS INFLUENCE INDIVIDUAL'S MOBILE INTERNET USAGE?

**Model 1** was tested to examine what social and demographic factors influence Internet browsing on the mobile phone. The findings are summarized in Table 7 below. Age was a significant positive predictor in one country, which is Rwanda; while it was a significant negative predictor in all other countries except Tanzania, Uganda, and Botswana. Being male increases the odds of browsing the Internet on his mobile phone in Ethiopia, Ghana, and Nigeria. In general, being a student increases the odds. The evidence was found in Ethiopia, Namibia, South Africa, Nigeria, and Botswana. However this variable was a negative predictor in Cameroon. The effect of marriage was significant only in Cameroon, indicating that married people are less likely to use their mobile phones to browse the Internet.

The effect of education on mobile Internet use was quite strong, which can be found almost in all the countries, except Cameroon. However an interesting question arises from some differences in the effect of two education variables: the highest education completed and the total years in schooling. In some countries such as Namibia, the highest education completed was negatively associated with the odds of browsing the Internet on mobile phones, which also indicates the negative correlation between the two educational variables. The possible explanation is that the total years in schooling do not equal to qualified education degrees, as people might choose to attend school just for learning knowledge or skills.

Being the household head increased the odds only in Namibia, Nigeria, and Botswana. The monthly disposable income was a significant positive predictor only in South Africa, Tanzania, and Nigeria. It is surprising that the effect of employment status did not achieve statistical significance in any of these countries and being employed was found to be negative related to the odds of mobile Internet use in Cameroon, Ghana, Namibia, and Uganda. An explanation for that might be that employed people and with a higher income can afford to browse the Internet with a PC, while lower income brackets of the population, which is unemployed and in most cases does not have a disposable income, can rely mostly on the mobile phone to access to the Internet

Although the effect of civic association measures varied across all the countries, findings on the effects were quite consistent. For example, belonging to religious groups, trade unions, farmers' associations or cooperatives, and recreational groups were found to be positive predictors of mobile Internet use. The effect of belonging to religious groups was only significant in Ghana. However we found that the effect of being affiliated with saving clubs or micro finance groups was mixed. It increases the odds in Ethiopia and Botswana; but it decreases the odds in Rwanda. On the contrary, belonging to any organized cultural or political groups reduces the odds and the effect of joining any decision making activities at either village or municipality level was not significant for all the countries.

Country	Chi-square	Nagelkerke R Square	Significant predictor	Negative correlation but not significant
Cameroon	57.307	.19	Age – Being married – Being a student – Farmers' associations or cooperatives + Recreational groups +	Being employed Monthly disposable income Belonging to trade union
Ethiopia	119.88	.44	Male+ Age- The total years in schooling+ Being a student+ Saving clubs or micro finance groups+ Recreational groups+	Being the household head Religious groups Trade unions Organized cultural or political groups
Ghana	204.86	.46	Male+ Age-	Student Being employed

			The highest education+ Religious groups+ Recreational groups+	Organized cultural or political groups Farmers' associations or cooperatives Decision making groups
Namibia	208.12	.45	Age – The total years in schooling+ Being the household head+ Being a student + Trade union+ Organized cultural or political groups- Recreational groups+	Male The highest education Being employed Religious groups Decision making groups
Rwanda	132.03	.51	Age+ The highest educational level+ Saving clubs or micro finance groups_ Recreational groups+	Being the household head Organized cultural or political groups
South Africa	370.45	.37	Age- The highest educational level+ The total years in schooling+ Being a student+ Monthly disposable income+ Organized cultural or political groups – (marginally significant) Recreational groups+	Religious groups Saving clubs or micro finance groups
Tanzania	76.39	.32	The highest educational level+ Monthly disposable income+ Trade union + (marginally significant)	Male Age Being the household head Religious groups Organized cultural or political groups Saving clubs or micro finance groups Decision making groups
Uganda	81.90	.22	The highest educational level+ Recreational groups+	Age Being the household head Being married Being student Being employed Religious groups Trade unions Farmers' associations or cooperatives Saving clubs or micro finance groups
Nigeria	288.08	.37	Being male+ Age- The highest education completed + Being the household head+ Being a student + Monthly disposable income+ Recreational groups+	Being married Organized cultural or political groups Farmers' association or cooperatives Saving clubs or micro finance groups Decision making groups
Botswana	211.30	.41	The highest education completed + Being the household head+ Being a student + Trade union+ Saving clubs or micro finance groups+	Age Religious groups Decision making groups

			Recreational groups+	
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**Model 2** was used to predict social media usage through the mobile phone. The model was found significant for all the countries. The summary of predictors in all countries can be found in Table 8 below. Age is generally a negative predictor, however it was found as a positive predictor in Rwanda. A positive correlation was found between a higher level of education and the possibility of using mobile phones for social media. The same relationship was identified between monthly disposable income and the dependent variable, although such evidence was not present in all the countries. The effect of being affiliated with saving clubs or micro finance groups, or recreational groups was mixed in all the countries, which was found missing, negative, or positive. The positive predictive power was found from belonging to trade union in Tanzania and Nigeria. The positive effect of farmers' association or cooperatives was only identified in Cameroon. Belonging to organized cultural or political groups or any religious groups decreased the odds of people accessing social media on their mobile phone. The effect of participation in decision making groups was not found from either of these countries.

In the case of Cameroon, the chi-square was 71.885 (df =16,  $p < .001$ , Nagelkerke R Square = .26). Being a student increases an individual's odds of accessing social media through a mobile phone by 34%. The effects of other demographics did not achieve statistical significance at the alpha level of .05. Among all the civic association variables, the strongest predictive power was found from recreational networks such as social reading groups or groups based on common interests in sports. This affiliation increases individual's odds of using mobile phones to access social media by 342.1% ( $B = 1.23$ ,  $p = .001$ ). The effect of being affiliated with farmers' association or cooperatives was also significant, which shows that the odds could be increased by 331.3% ( $B = 1.20$ ,  $p < .01$ ). The effect of belonging to trade union was close to significant ( $B = -1.55$ ,  $p = .05$ ). The negative regression coefficient indicates that this affiliation reduces mobile users' odds of accessing social media through their phones by 21.3%. Though the predictive effect was not significant, being affiliated with saving clubs or micro finance groups was negatively related to the use of mobile phones for social media ( $B = -.008$ ,  $p = .99$ ).

In Ethiopia, the chi-square of model 2 was 70.904 (df =16,  $p < .001$ , Nagelkerke R Square = .43). Gender, age, and the total years of schooling were found as significant predictors in the group of demographics. Males are more likely to use their mobile phones to access social media, compared to females. Being a male increases the odds by more than 4 times ( $B = 1.40$ ,  $p < .05$ ). The younger the users, the higher odds of using social media on their phones ( $B = -.26$ ,  $p < .01$ ). One year increase in age reduces the odds by 77.1%. The total years in school was found to be a positive predictor ( $B = .72$ ,  $p = .001$ ). One year increase in schooling increases the odds of using mobile phones for social media by 204.6% (in the questionnaire, level 1 is none, 2 is primary, 3 is secondary, 4 is tertiary: diploma /Certificate, 5 is tertiary: BSc/BA, 6 is tertiary: Masters, and 7 is tertiary: PhD). Among all the civic associations, belonging to religious groups was the only significant predictor ( $B = -1.134$ ,  $p = .05$ ). It indicates that this affiliation reduces the odds by 32.2%. Though other variables were not significant, it is worth mentioning that belonging to trade union, organized cultural or political groups, farmers' association or cooperatives, and decision making groups were also negative predictors of using social media on mobile phones.

The model 2 for Ghana was also significant. The chi-square of model 1 was 189.90 (df =16,  $p < .001$ , Nagelkerke R Square = .45). Being a male increases the odds of accessing social media use through mobile phones by 219% ( $B = .78$ ,  $p = .011$ ). Age was a negative predictor ( $B = -.09$ ,  $p = .001$ ). The highest educational level was the strongest predictor among all the demographics ( $B = 1.23$ ,  $p = .000$ ). However the total year in schooling was not a significant predictor. The finding also shows that being a household head also increased the odds by more than 3 times ( $B = 1.11$ ,  $p = .038$ ). The only significant predictor from civic associations was belonging to recreational networks which are based on common interests ( $B = 1.25$ ,  $p = .001$ ). It increased the odds by 347.1%. All the civic association measures were positively related to social media use on mobile phones, except being affiliated with farmers' association or cooperatives ( $B = -1.11$ ,  $p = .076$ ).

In the case of Namibia, the chi-square of model 2 was 194.06 (df =16,  $p < .001$ , Nagelkerke R Square = .45). Age is found to be negatively related to social media use on mobile phones ( $B = -.04$ ,  $p = .007$ ). The total years in schooling was a stronger predictor ( $B = .25$ ,  $p = .002$ ), which shows that one year increase in school increases the odds by 128%. It is interesting to observe that the highest educational

level was negatively related to social media through mobile phones and its effect was not significant. Also in this country the only significant predictor from civic association was recreational networks ( $B=1.39$ ,  $p=.000$ ). People who belong to such groups are 4 times more likely to use social media through their mobile phones. All the other civic association measures were positively related to social media use on mobile phones, except being affiliated with organized cultural or political groups ( $B=-.06$ ,  $p=.831$ ).

The model 2 for Rwanda was significant. The chi-square was 152.48 ( $df=16$ ,  $p <.001$ , Nagelkerke R Square = .60). Three demographics were found to be positive predictors for social media use through mobile phones such as age, total years in schooling, and monthly disposal income. Total years in schooling has the strongest effect on the model and it increases the odds by 169.2%. It is interesting to see that age is a positive predictor, which is different from findings discussed earlier. There are four variables of civic associations that were found significant. Belonging to trade union, organized cultural or political groups and recreational groups were positive predictors. The effect of recreational groups was the strongest, which increases the odds by more than 6 times. The affiliation with saving clubs or micro finance groups was the only negative predictor, which is consistent with findings from other countries discussed so far.

Also for South Africa the model 2 was significant. The chi-square was 369.59 ( $df=16$ ,  $p <.001$ , Nagelkerke R Square = .38). Age was the only negative predictor among demographics. One year increase reduces the odds by 94.2%. The total years in schooling, being household head, being a student, and monthly disposable income were all positive predictors. There were only two civic associations that were found significant. Belonging to organized cultural or political groups reduces the odds by 53.% while being affiliated with recreational groups increases the odds by 173%. In this case, belonging to any saving clubs or micro finance groups was negatively related to social media use through mobile phones. The same relationship was found from being affiliated with decision making groups at village or municipality levels.

The chi-square for model 2 in Tanzania was 105.69 ( $df=16$ ,  $p <.001$ , Nagelkerke R Square = .50). There were only two significant predictors in this model: the highest level of schooling completed and the affiliation with trade union. They both could increase the odds by more than 3 times. Among all the civic association variables, belonging to religious groups, organized cultural or political groups, saving clubs or micro finance groups, and any decision making groups were all negatively related to social media use through mobile phones.

The chi-square of model 2 in Uganda was 189.90 ( $df=16$ ,  $p <.001$ , Nagelkerke R Square = .45). Being a male, being more educated, and being the household head all increase the odds of accessing social media through mobile phones. The highest level of schooling was the strongest predictor among these, which shows that one unit increase in education increases the odds by 342.9%. Belonging to any recreational groups was the only significant predictor among all civic association measure, which increases the odds by 347.1%. All these measures were positively related to social media on mobile phones except being affiliated with farmers' associations or cooperatives.

The chi-square of model 2 for Nigeria was 259.05 ( $df=16$ ,  $p <.001$ , Nagelkerke R Square = .35). Being a male, being more educated, being the household head, and being a student all increase the odds of accessing social media through mobile phones. The effect of being the household head was the strongest, which increases the odds by 314.1%, followed by the effect of education which increases the odds by 219.5%. Age and the total years in schooling were negative predictors. Being affiliated with trade union and recreational groups were the only two predictors among all civic association measures, which could both increase the significance. Belonging to religious groups, farmers' association or cooperatives, and decision making groups were all positively related to social media usage on mobile phones, although only belonging to common interest groups was found significant.

The chi-square of model 2 for Botswana was 209.58 ( $df=16$ ,  $p <.001$ , Nagelkerke R Square = .43). Being younger, being more educated, being a student, and being employed could increase the odds of using social media on mobile phones. The strongest effect was found from being a student, which could increase the odds by more than 14 times. All civic association measures were positively related to social media access on mobile phones except the affiliation with religious groups or decision making groups. There were only two significant predictors: belonging to saving club or micro finance groups and recreational groups. They both could increase the odds by more than twice.

Table 8 summary of model 2: predicting social media use through mobile phones				
Country	Chi-square	Nagelkerke R Square	Significant predictor	Negative correlation but not significant
Cameroon	71.89	.26	Being a student- Trade union- (marginally significant) Farmers' association or cooperative+ Recreational groups+ Decision making groups+	Age Being married Being employed Monthly disposable income Saving clubs or micro finance groups
Ethiopia	70.90	.43	Being male+ Age- The total years in schooling+ Religious groups – (marginally significant)	The highest education completed Trade union Organized cultural or political groups Farmers' association or cooperative Decision making groups
Ghana	204.86	.46	Being male + Age- The highest education completed+ Recreational networks+	Being a student Being employed Organized cultural or political groups Farmers' association or cooperative Decision making groups
Namibia	194.06	.45	Age- The total years in schooling+ Being student+ Recreational groups+	Being male The highest education completed Organized cultural or political groups Decision making groups
Rwanda	152.48	.60	Age+ The total years in schooling+ Monthly disposable income+ Trade union+ Organized cultural or political groups- Saving clubs or micro finance groups_ Recreational groups+	The highest education completed Decision making groups
South Africa	369.59	.38	Age- The total years in schooling+ Being the household head+ Being a student+ Monthly disposable income+ Organized cultural or political groups- Recreational groups-	Being married Saving clubs or micro finance groups Decision making groups
Tanzania	105.69	.46	The highest education completed+ Trade union+	Being male Being married Religious groups Organized cultural or political groups Saving clubs or micro finance groups Decision making groups
Uganda	189.90	.45	Being male+ Age- The highest education completed+ Being the household head+ Recreational groups+	Being a student Being employed Monthly disposable income Farmers' association or cooperative
Nigeria	259.05	.35	Being male+ Age-	The total years in schooling Being married

			The highest education completed+ Being the household head+ Being a student+ Trade union+ Recreational groups+	Religious groups Farmers' association or cooperative Saving clubs or micro finance groups Decision making groups
Botswana	205.58	.43	Age- The highest education completed+ Being a student+ Being employed+ Saving clubs or micro finance groups+ Recreational groups+	Religious groups Decision making groups

## DISCUSSION and CONCLUSIONS

Research findings on mobile Internet access and usage across 10 African countries revealed that not only mobile ownership has reached 40% threshold critical mass believed to bring about network effects associated with economic growth, but also the number of Internet-enabled mobile devices is growing across the population. Also, in countries with a higher level of mobile ownership and with a higher penetration of Internet-enabled mobiles such as Nigeria, Namibia, South African and Botswana one of the main Internet activities is to use the mobile phone for social networking.

Evidence highlighted that mobile phone usage increases contacts with family, friends and colleagues, but the research did not identify significant evidences related to the fact that mobile phone usage increases contacts with political groups. Further, data show that the phone has been used for safety and security reasons, but there was no significant evidence on using the phone for mobilizing the community or for political events.

Although the research identified many differences across the African countries surveyed, the most significant predictor of using social networks through the mobile phone is to be a student – with a positive correlation between a higher level of education and the usage of the social networks through the mobile phone - and to be affiliated to a recreational network. Conversely, age has been found to be a negative predictor in most of the countries under investigation. However, it is found to be significant in countries with a very low level of GDP per capita such as Rwanda, where computer usage is negligible. Similarly, the effect of being employed had a negative correlation to the odds of mobile Internet usage, leading to the conclusion that employed population or population with a disposable income might prefer browsing the Internet with a personal computer.

Also belonging to religious groups, which is very common across the African population, decreases the odds of people accessing social media through the mobile phone. In addition, belonging to a cultural, political organisation and belonging to a decision making group decreases the odds of using social networks through the mobile phone in all the countries analysed.

The predominant predictors of a mobile Internet user emerged are being a young student, male and with a low income. Usually users get connected to the Internet through social media platform either to keep in touch with family and friends or for entertainment. Very little evidence has been found of using the mobile Internet and social media through the mobile phone for social mobilization or to keep in touch with political organisations. Rather, belonging to a recreational group has been found a strong predictor of mobile Internet adoption.

The policy implications of this are significant. Traditional reform strategies of increasing competition in the telecommunications market to improve market entry, increase the choice of services, improve the quality of services and drive down prices, that would meet pent up demand through improving the efficiency gap in the market are more likely to enhance access to the Internet than traditional universal service strategies that seek to aggregate users or complex mechanisms to subsidise low end users.

However, while greater competition in some of these markets and more effective regulation of them may improve market efficiency and mop up some of the demand for services with lower prices, a real



access gap may exist in some currently underserved areas where incomes may be very low and the cost of getting services are high.

If prices decrease and demand for services is met through addressing the efficiency gap within markets (through competition or effective regulation) there should be a significantly reduced need for universal service interventions such as subsidising network extension or low-end users. There is still substantial progress to be made in reducing barriers to prepaid mobile broadband, ranging from lowering cost of devices and services, reducing taxation and improving access to underserved areas. Policy in support of greater Internet access will still need to balance this new opportunity to affordably access the Internet with the demand for high speed always on bandwidth required to optimise Internet usage under particular high usage residential, educational and business circumstances than determine a country's global competitiveness.

Taking into account the growing demand for mobile Internet services in the African context, effective spectrum allocation and assignment through refarming of premium frequencies for a fast deployment of broadband services especially in rural and perceived uneconomic areas is paramount. Also, available spectrum needs to be assigned and allocated through innovative mechanisms tailored to the African context, where technical skills at a regulatory level might be poor. In this case, mechanisms of allocating and assigning spectrum bands suitable for LTE services should be designed taking into account both a fast-growing demand for wireless broadband services and a low level of technical skills at a regulatory level.

On the other hand, demand-side stimulation strategies to foster Internet adoption, especially through the schooling system, is still required. Although a growing demand for wireless broadband services, computer usage and Internet usage across the continent is still very little (Calandro, Stork and Gillwald, 2012). Computer and Internet literacy programmes through the schooling system, need to be encouraged.

Censorship of the Internet in countries where the Internet take up is slow or constrained by high prices of broadband and data may impact not only on the democracy of that country but also on the growth and on the development of the mobile Internet sector. New challenging questions on whether mobile operators are liable also for the content they carry and whether they could be treated as media operators if action is taken as a result of social mobilisation through the mobile phone (Southwood, 2010), together with the question on the legitimacy of these acts, need to be addressed.

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