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Emerald Article: Will telecommunications development improve the quality of life in African countries?

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Abstract

Purpose – *This study aims to measure quality of life (QOL) at the individual level in African countries in relation to the accessibility of mobile phones and the internet. QOL is proxied by self-reported data on household income, participation in decision-making and productivity, which is measured in additional working hours.*

Design/methodology/approach – *The main methodology is a descriptive analysis that presents a cross-tabulation of the QOL indicators before and after access to mobile phones and the internet. A specific index of the Gini coefficient and Lorenz curve is also presented in relation to income distribution.*

Findings – *The study found that access to telecommunication devices has contributed very little to closing the income gap in places where the mobile phone has had a slightly higher impact than internet access. The impact on self-reported participation and productivity is also similar in places where there is no strong evidence that access to both devices is sufficient to motivate users to become more involved and productive.*

Research limitations/implications – *The choice of the QOL variables is still under discussion. It also has to be said that the proxies for QOL are still very raw, as is the way of measuring it. The descriptive analysis does not provide the causality between the variables, and is rather an indication of the phenomenon – whether access to telecommunication devices leads to a better QOL index.*

Practical implications – *This paper indicates a need to design policies for the telecommunications sector in African countries with a stronger connection between access to and use of the devices and economic activities. The policy should also aim to reduce the polarisation of access and use by providing a telecommunications infrastructure in all the countries, thereby decreasing the cost of access and usage. Such policies require close collaboration between the governments and the private sector.*

Originality/value – *This paper attempts to answer the research question of whether access to telecommunication devices, particularly mobile phones and the internet, has led to a better QOL in African countries. It indicates a need for telecommunications policies and infrastructure to reduce the polarisation of access and use.*

Keywords *Mobile phone, Internet, Quality of life, Africa*

Paper type *Research paper*

Introduction

It has been ascertained from many previous studies that information and communication technology (ICT) development, in particular in the telecommunications sector, has contributed significantly to the growth of the economy. Compared with other sources of growth, Gould and Ruffin (1993) conclude that technological progress is what ultimately determines growth. The important role of investment in telecommunications infrastructure to boost the growth of GDP is also the bottom line of studies by Nadiri and Nandi (1999) and Roller and Waverman (2001). Numerous other studies support this conclusion, for instance Jipp (1963), Hardy (1980), Saunders (1981), Lichtenberg (1995), and Greenstein and Spiller (1996), and the recent investigations by Madden and Savage (1998), Dutta (2001), Shiu and Lam (2008) and Chakraborty and Nandi (2009). The evidence from developing countries,

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particularly in Africa, also shows that ICT contributes greatly to the catalytic role of investment in many sectors of the economy, particularly in its effect on small and medium enterprises. ICT has been found to reduce transaction costs, and increase efficiency and market access (Stork and Esselaar, 2006).

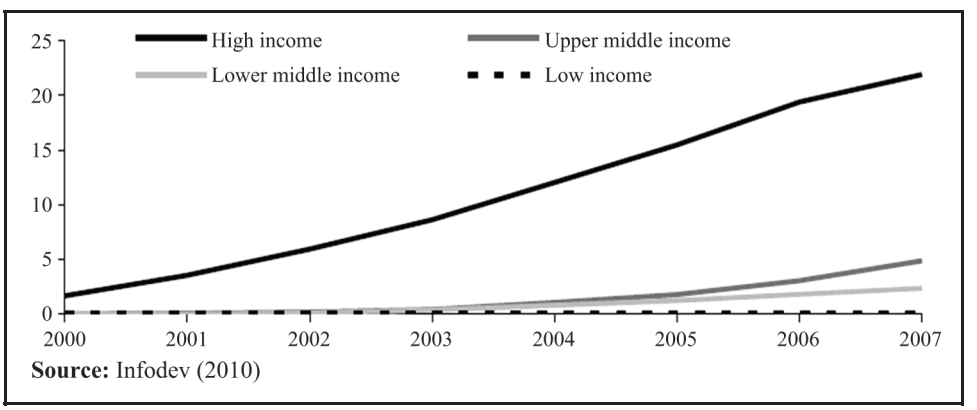
Following the recent development of ICT sectors, the internet and broadband access have been conceived as the most important aspects to be enhanced in developing countries in the near future. The International Telecommunication Union (ITU, 2010) considers broadband a catalyst for growth and, thus, the next tipping point for generating jobs, driving growth and productivity, and underpinning long-term economic competitiveness, as well as contributing to achieving the Millennium Development Goals (MDGs). Nevertheless, with regard to the current progress of broadband deployment, the gap between high-income countries and low-income countries is still clearly visible. The high-income countries had achieved a 20 per cent penetration rate by the end of 2007, with the upper-middle attaining a 5 per cent penetration rate. The lower-middle-income and low-income countries were left behind with a penetration rate of approximately 1 per cent. Figure 1 shows the disparity in broadband penetration between the groups.

From Figure 1, it can be concluded that without accelerating the supply of and demand for broadband access, developing countries will require more time to narrow the broadband sector gap. Moreover, the need to investigate the impact of broadband development is important, as the issue is relatively recent for developing countries, which has meant that fewer investigations have been conducted in country-to-country analyses and case studies (Infodev, 2010).

In addition, when discussing the type of technology, it is often proposed that wireless technology plays an increasingly prominent role in the expansion of rural telecommunications networks in developing countries (Reynolds and Samuels, 2004; Galperin, 2004). More importantly, mobile technologies not only offer a substantial cost advantage over fixed-line infrastructure for rural networks but are also better suited to service the demands of rural low-income populations (Proenza, 2006). In Africa, particularly in places where the current broadband prices is still double or triple those of equivalent services in developed countries, the importance of mobile broadband internet is undeniable. In countries such as Ethiopia, Malawi and Niger, a slow broadband connection costs many times the average monthly salary, while it costs less than 1 per cent of the average monthly income in developed countries (SAWC, 2011).

The ITU (2010) states that while high-speed internet is still out of reach of many people in low-income countries, mobile telephony is becoming ubiquitous, with access to mobile networks now available to over 90 per cent of the global population. It was estimated that mobile subscriptions would reach 5.3 billion by the end of 2010, with 3.8 billion of these in the developing world. The benefits of broadband will be even greater once adequate and

Figure 1 Broadband penetration rate between groups of countries



Source: Infodev (2010)

affordable access is available. However, it has to be taken into consideration that, as reported by Southern African Wireless Communications (2011), mobile broadband can lessen the digital gap in Africa up to a point, but it is expensive and has limited capacity, which has led to the need to roll-out fibre-optic cable in the long run.

Beyond GDP

In the different domains of discussion, there has been a long debate questioning the reliability of GDP in reflecting quality of life (QOL) at the individual level. This is due, in particular, to the fact that many intangible values of QOL have not been captured by the single indicator of GDP. Early economists and philosophers, ranging from Aristotle to Bentham, Mill and Smith, incorporated the pursuit of happiness in assessing welfare. However, as economists grew more rigorous and quantitative, a more parsimonious definition of welfare took hold; hence, the explanation that QOL is affected only by income is generally challenged (Graham, 2009). GDP, which places greater emphasis on the achievement of material aspects, has received much criticism during the past few decades by, among others, early economists such as Kuznets (1941), Hicks (1948), Galbraith (1958) and Samuelson (1961), and recent ones like Dasgupta and Mäler (2000), Ng (2003) and Kahneman *et al.* (2004). Therefore, an assessment of the impact of telecommunications development should also move beyond merely investigating the impact on GDP, as has been found in the majority of the current studies.

In the context of Africa, the fact that the continent is thinly integrated into the global value chain of the ICT sector has made its growth in this regard generally lower than that of any other region. Despite this, the sector has obviously contributed to better education, health and governance (leadership and government), as well as socio-economic well-being (poverty reduction), political stability and self-actualisation (Okpaku, 2006). Picking up on Okpaku's (2006) study, which was carried out using a mainly qualitative research approach, it was an appealing prospect to scrutinise how telecommunications development actually affects the attainment of QOL using a more numerical analysis. Two devices (the mobile phone and the internet) were chosen on the basis of the fact that mobile broadband is projected to be the dominant mode on the continent (SAWC, 2011). To enable this investigation, the study measured QOL at the individual level, proxied by self-reported data on household income, participation in decision-making and productivity, which was measured as additional working hours before and after access to such devices. Hence, the research question to be answered was – has telecommunications development, in terms of connectivity to mobile phones and the internet, affected QOL and, if so, to which aspect thereof has it contributed?.

To achieve this aim, descriptive analysis from the primary survey conducted by Research ICT Africa (RIA) in 2010 was employed. The tabulation (tabstat) compared the QOL of the individual before and after access to the internet and mobile phones. A measurement of the Gini coefficient was also employed in relation to the impact on income.

The paper is presented as follows. The introduction and discussion of GDP as a measure of QOL above is followed by a picture of telecommunications development in Africa. Thereafter the methodology of the study and a data analysis are presented. After a descriptive analysis of the results, a conclusion and recommendations are offered.

Telecommunications development in Africa

It generally goes unnoticed that milestones in the development of telecommunications infrastructure in African countries roughly coincide with those of countries in Asia. The first radio relay link in Africa was built in 1951 in Morocco, marking the first step in the development of the sector, when many African countries were still colonized. Three decades later in 1981, Asia and Africa were linked by a 355-km hop over the Red Sea between Sudan and Saudi Arabia (Carmodi, 2010). In general, the Asian region has been the leader in terms of telecommunications development, namely mobile phone, internet and broadband penetration, with the African region left behind, mainly due to limited traffic, under-capacity,

poor maintenance and a lack of infrastructure (UNDP, 2004; ITU, 2010). For instance, in Nigeria, of the 720 000 lines owned by Nigerian Telecommunications (NITEL), approximately 492 000 lines were used, and only six of the 14 most populous cities had international direct dial by the year 2000. In Egypt, where 25 per cent of households have a phone connection, the waiting list for access demand reached 1.2 million over the last decade. In terms of mobile telephony, 97 per cent of the population has access to mobile phones in Tanzania, although this does not necessarily mean that all are mobile phone/handset subscribers (Carmodi, 2010).

External factors (e.g. civil wars and political issues) also contribute greatly to the slower rate of telecommunications development. As a result of the civil war in the Congo, teledensity has declined to just 0.04 per cent, which was the lowest for the African countries at the end of 2000. In South Africa, the teledensity of fixed lines had reached 10 per cent by 1990. At that time, however, the penetration rate was very unevenly distributed, with 64 per cent in the white areas and less than 1 per cent in the rural black areas (Carmodi, 2010). Likewise, in Angola, the high level of poverty, strong political influence on the mobile phone market and unstable global economy (particularly with oil price fluctuation) affect the development of the telecommunications sector (SAWC, 2011).

Calandro *et al.* (2010) summarise the performance of the telecommunications sector on the continent, stating that in countries such as Ghana, Kenya, Nigeria and Senegal, the sector is showing a promising outlook, while Africa as a whole continues to lag behind other regions. The report highlights major issues underpinning the sector, ranging from a lack of technological advancement to poor policies regarding market entry and competition, weak institutional arrangements and exorbitant taxes on use. Consequently, while voice has been able to close the gap, the digital divide remains visible for the internet, and the development of the broadband sector is almost non-existent.

Moreover, the continent continues to decline or stagnate in fixed line deployment at about a 3 per cent penetration rate, with the exception of countries such as Nigeria, Côte d'Ivoire and Ethiopia. Conversely, the penetration rate of mobile phones has doubled since 2006, even though it is still lower than the critical mass of 40 per cent, which is believed to be the turning point for achieving a higher network effect. In this regard, multiple SIMs have problematised the issue, creating double counts in the measurement of penetration rates. Also, because 96 per cent of subscriptions are prepaid, vast SIM wastage is a common phenomenon (Kadium Ltd, 2011). The mobile phone market is also facing the affordability issue, amid continual growth, of the price still prohibiting further access to and use of the devices owing to the higher tax charged to end-users in sub-Saharan countries like Tanzania and Uganda. The excessive tax of 30 per cent in Uganda is one example of the way policy hinders the growth of user numbers, which is also influenced by demand-side challenges such as digital literacy and affordability of access devices such as personal computers.

Unlike the mobile phone, which has shown promising features, the internet and broadband are still at the early stage. The internet penetration rate recorded was only 3 per cent, on average, across the continent, whereas broadband is almost unseen, having an average penetration rate of less than 1 per cent. Tunisia is the leading nation in the development of such devices, achieving a penetration rate of 34 per cent at the end of 2009. The higher take-up cost for the internet and broadband is the major issue; hence, a country with a higher GDP per capita is more likely to be connected to the devices and, thus, also to have affordable start-up and usage costs. In this regard, a limited terrestrial and submarine transmission network is also an inhibiting factor.

A recent report, however, has shown more promising progress in the telecommunications market in Africa. The smartphone, for instance, currently makes up 10 per cent of the handset market in Africa; despite being centred on high-income users, its use is expected to double by 2014, with the Blackberry recording the fastest growing market compared with any region by mid-2011. The auspicious market in Africa is also indicated by Facebook's plan to build the world's first Facebook-centred smartphone in an emerging market, in which the mobile internet intake will clearly have a window of opportunity (Ware, 2011).

Having explored the progress of telecommunications development in Africa, especially with regard to mobile phones and the internet, this study observes whether this progress has delivered an improvement in QOL.

Methodology and data analysis

Framework

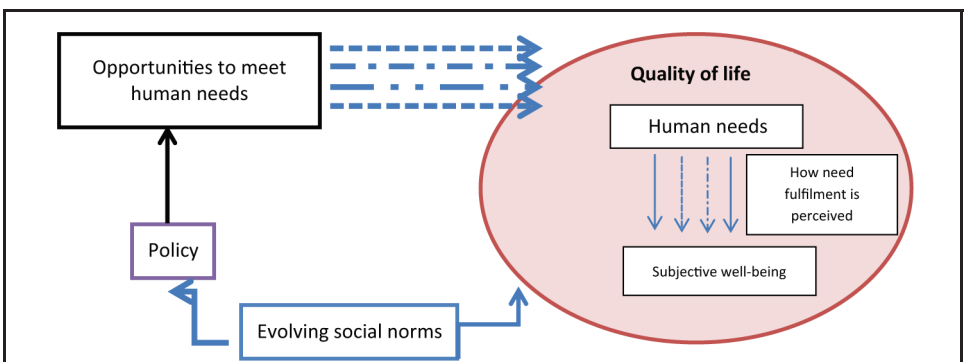
Previous studies have questioned the impact of telecommunications development beyond the effect on GDP. Rohman (2011) has investigated whether the contribution by the ICT sectors supports health and education in the Asia Pacific countries[1]. The study found no evidence of a long-term relationship between telephony and internet penetration rates and education and health. Another study concerning QOL by Lee and Leung (2005) assessed the impact of internet adoption on QOL in the three largest cities in China – Beijing, Hong Kong and Taipei. The study stated that the development of technology, in particular the internet, has also brought undesirable consequences. Besides many positive impacts, the internet has created circumstances that force people to undertake more work at home and, thus, it also has negative (and positive) social consequences.

The need to observe QOL as an alternative has been discussed intensively, as the use of a single indicator, namely GDP, to represent welfare has been challenged (Sen, 1985; Diener and Lucas, 1999; Easterlin, 2003). Recent research on measuring QOL centres on two approaches (Costanza *et al.*, 2008). The first, related to subjective well-being, focuses primarily on self-reported levels of happiness, pleasure and fulfilment (Diener and Lucas, 1999; Easterlin, 2003), whereas the second employs a more objective measurement that deals with quantifiable indices. As Costanza *et al.* (2008) stress, the first approach can only provide a snapshot of how well physical and social needs are met, but is unable to incorporate many issues that contribute to QOL, for instance, identity, participation and psychological security.

The framework constructed by Costanza *et al.* (2008) is a useful representation of the assessment of QOL (see Figure 2), influenced as it is by previous studies related to this discourse, for instance, the Matrix of Human Needs (Max-Neef, 1992), the Hierarchy of Needs (Maslow, 1954), the Need Hierarchy Measure of Life Satisfaction (Sirgy, 1995), the Quality of Life Questionnaire (Greenley *et al.*, 1997) and the Quality of Life Inventory (Frisch, 1998).

Figure 2 shows that QOL is the extent to which objective well-being is achieved through the personal or group perception of subjective well-being. Human needs, therefore, are the basic needs of subsistence, reproduction, affection, etc., whereas subjective well-being is assessed from individual responses to questions about happiness, life satisfaction, utility and welfare. The relationship between specific human needs and perceived satisfaction can

Figure 2 Theoretical framework of QOL



Source: Costanza *et al.* (2008)

be affected by mental capacity, cultural context and information. With regard to this aspect, the role of policy is to increase the likelihood that people will take the opportunities to meet human needs, given their perceived value of QOL.

Fahey *et al.* (2003) also discuss some characteristics of the QOL concept. They state that the measurement requires a micro-perspective in which the perception of individuals plays an important role. In other words, the macroscopic features of the economic and social situation within society are not at the centre of the measurement. Besides this, the concept covers multidimensional aspects. Thus, several areas of life broaden the narrow focus on income. Not only does the concept require a description of several aspects, it also explains the interplay between domains, as together they contribute to the measurement. Of the many variables that coherently build the measurement of QOL, this paper looks only into three self-reported ones: income; participation; and productivity. Income is employed to represent a more quantitative measurement, whereas the two other variables reflect a more qualitative dimension of QOL.

In addition, the measurement of productivity should refer to the relationship between aggregate inputs and outputs (Rowlands and Olivieri, 2007). However, due to the limitation in the availability of the data in the survey, the variable of productivity in this study only refers to the input at the current state: whether access to the mobile phone and internet has increased the hours of work by the individual.

As a consequence of using the subjective measurement, the self-reported qualitative aspect becomes part of the criticism. The term ''self-reported data'' refers to data obtained from surveys containing items that ask the respondents to report something about themselves and which are completed by the respondents themselves. The questions vary widely and include demographic variables, personality traits, values, beliefs, attitudes, effects and behaviours. Chan (2009) summarises the common criticism that self-reported data usually deals with two types of validity associated with the data collection process: construct validity related to the measurement of the variables; and the interpretation of a substantive relationship inferred from the relationship between self-reported variables (also known as mono-method bias). However, previous studies demonstrate reasonable criterion-related validities of self-report predictor measures in which the criteria are not self-report measures and for which there is a theoretical basis. Other studies in favour of self-reported data are Barrick and Mount (1991) on ratings of job performance, Becherer and Maurer (1999) and Grant (1995) on entrepreneurial behaviour and career success, and Brett and VandeWalle (1999) on training and sales performance. A self-report measurement has been conceived as a useful approach even in quantifying work productivity for which there is no available observed data (Kessler *et al.*, 2003)

Data

The primary survey by Research ICT Africa (RIA) served as the base of the data in this study. The survey was carried out in 2008 in 17 countries in Africa and comprised 22,446 households. The survey consists of two units of analysis: households; and random individuals representing each household. While income distribution mainly represents the analysis at the household level, self-reported participation and productivity are evaluated at the individual level. The results of this demand-side data survey have been employed to generate knowledge-based studies in support of ICT policy and regulatory processes in some African countries. The country reports aim to monitor and review policy and regulatory developments on the continent and to generate relevant information for policy-makers and regulators.

Income distribution

In the context of Africa, this study assumes that mobile phones will be able to improve economic activity and reduce poverty by providing rural households with fast and easy modes of communication, thereby increasing their ability to access livelihood assets, undertake diverse livelihood strategies and overcome their vulnerabilities (Sife *et al.*, 2010).

Two interrelated analyses are displayed in this section. The Gini coefficient, derived from the study by Corrado Gini in 1912, shows the distribution of income (Gini, 1912). The inequality distribution ranges from a value of 0 to 1, with the lower Gini indicating full equality, while a value of 1 shows maximum inequality. The technical measurement of the indicator is calculated on the basis of the Lorenz curve. The curve draws the proportion of the total income of the population (y-axis) that is cumulatively earned by the bottom x per cent of the population. The line at 45 degrees pictures perfect equality of incomes. The Gini coefficient, therefore, is the ratio of the area that lies between the line of equality and the Lorenz curve[2].

Participation

The analysis concerning participation is based on the following survey question:

Do you participate in decision-making at village/city/municipal level?

- Yes.
- No.

The hypothesis assumes that when people are connected to ICT devices they are able not only to receive more information but also to disseminate their knowledge to society. Hence, a well-informed respondent is assumed to be more active in the decision-making process (Hendriks, 1999; Venkatesh *et al.*, 2010).

Productivity

The other self-reported data investigated in this study concerns the comparison of working hours before and after obtaining a connection to a mobile phone and the internet. This analysis is crucial, assuming that QOL has a positive relationship to individual productivity (Dalgaard *et al.*, 2009; Kingpadung and Phusavat, 2010; Dabirian *et al.*, 2010). Investigating the performance of new workers in the USA, Shapiro (2005) found that while the majority of the employment growth effect of college graduates operates through changes in productivity, roughly one-third of the effect seems to come from more rapid improvement in QOL.

To measure productivity, the number of hours is considered to represent the intended variable best, as found in previous studies by Henning (1991), OECD (2001) and Morikawa (2010). The data are extracted on the basis of the following survey questions.

1. How often on average have you used the internet in the last 6 months?
   - [_] - [1] Every day or almost every day.
   - [_] - [2] At least once a week.
   - [_] - [3] At least once a month.
   - [_] - [4] Less than once a month.
2. Would you say that compared with *6 months ago*, the number of *hours a week* has:
   - [_] - [2] Stayed same.
   - [_] - [3] Decreased.
   - [_] - [1] Increased.

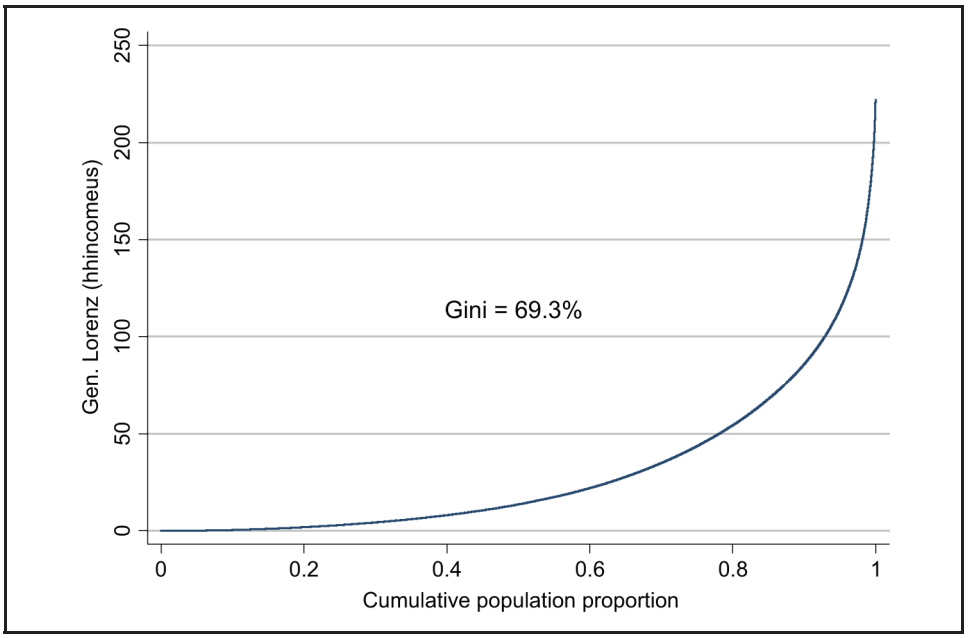
Results

The following section discusses the descriptive analysis of three aspects of QOL: income distribution; participation; and productivity.

Income distribution

The Gini coefficient and Lorenz curve are presented in Figure 3 to show the disparity in income as a result of mobile phone and the internet connectivity in African countries.

Figure 3 Lorenz curve and Gini coefficient in 17 samples of African countries



The shape of the Lorenz curve shown in Figure 3 indicates severe inequality, with a small proportion of the population having a greater proportion of the income. Figure 3 shows that 80 per cent of the cumulative population only owns 50 per cent of the household income. This is reinforced by the self-explained finding that the Gini coefficient is as high as 69.3 per cent.

This number is higher than in official reports published in previous studies in African countries. UNECA (2001), for instance, reported the coefficient as only 52 per cent in 2000. Higgins and Williamsson (1999) recorded the trajectory of the Gini coefficient in African countries between the 1960s and the 1990s, revealing that the coefficient was never greater than 50 per cent during this period: 45.3 per cent in the 1960s, 49.8 per cent in the 1970s, 41.6 per cent in the 1980s and 46.4 per cent in the 1990s. Nevertheless, fewer countries were investigated in these studies, especially during the early studies when only four countries were evaluated (as opposed to the 11 and 15 countries included in the 1980s and 1990s, respectively). While the difference should be addressed as measurement bias, the present study is still significant as an attempt to relate the inequality of income, comparing respondents who have access to mobile phones and the internet with those who do not.

Table I shows a cross-tabulation of respondents with access to mobile phones and the internet as the control variable.

Table I is calculated by taking the individual weight into account to best represent the population in the study. It is clear that the majority of individuals in the study – 12,172 (55.33

Table I Access to a mobile phone and the internet

	Internet			
	0		*1*	
Mobile	n	*Per cent*	n	*Per cent*
0	12,172	53.33	144	0.63
1	8,848	38.76	1,662	7.28

Notes: 1 = Yes, 0 = No
Source: Raw data from RIA (2008)

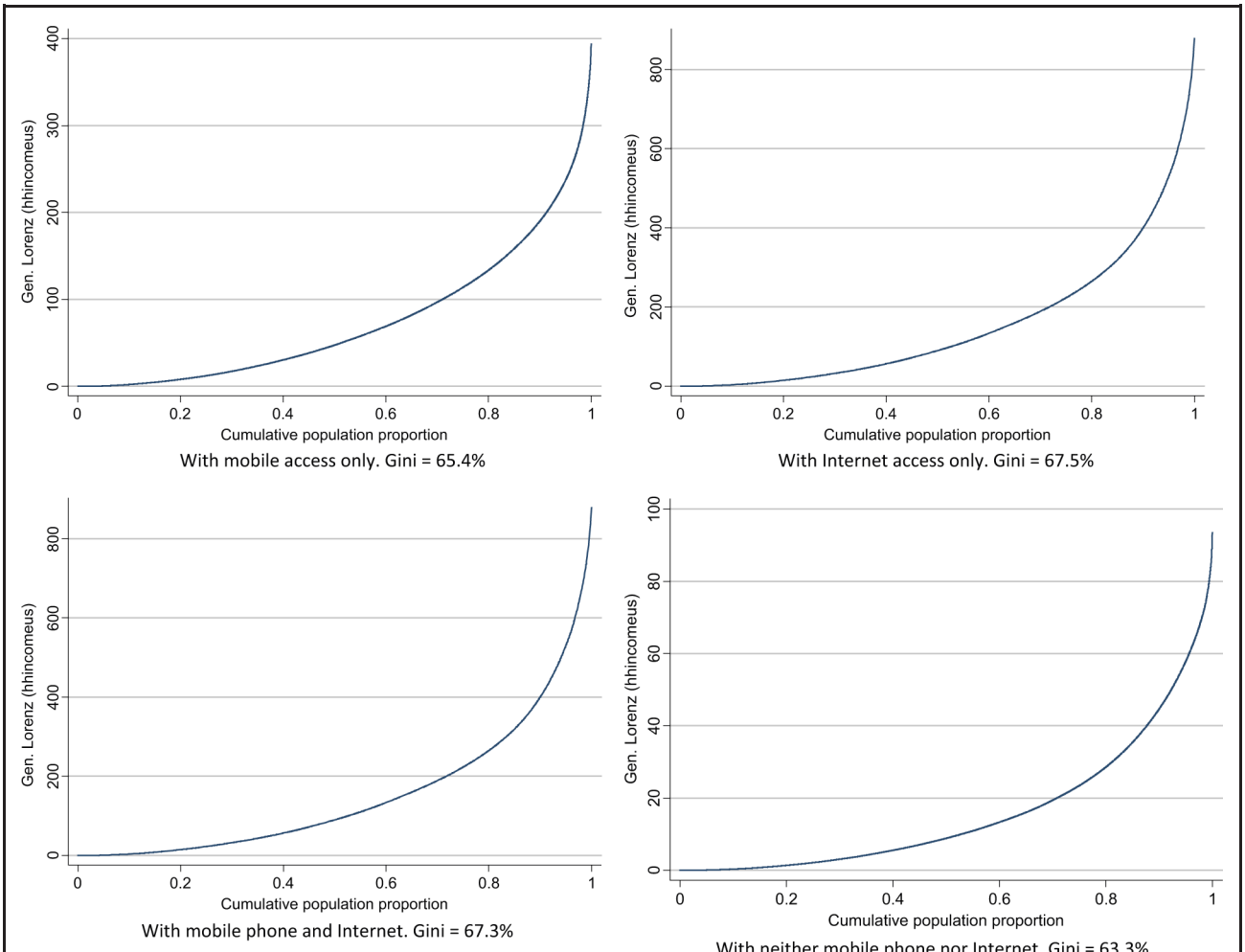
per cent) – are still unconnected to either device (the mobile phone or the internet). Moreover, only 144 (less than 1 per cent) of the respondents are connected to both devices.

Employing this table as the tool for benchmarking, Figure 4 describes how the shape of the Lorenz curve differs depending on the control of the ownership of these devices.

Figure 4 pictures the simulation of the Gini coefficient and Lorenz curve based on four different scenarios for the respondent: with a mobile phone; with the internet; with both devices; and with neither device. The analyses of the Lorenz curve and the Gini coefficient were carried out at household level, while the control variable on access to a mobile phone and the internet was gathered at individual level. The measurement shows that inequality of income is not significantly different based on scenarios adopted in the analysis. Nevertheless, mobile phone access has the edge on closing the gap of income inequality indicated by the coefficient, which is lower than that for the internet (65 per cent compared with 67 per cent).

With regard to this result, a study by Gillwald and Stork (2008) found that while mobile telephony has been able to address the gap between those who have voice service and those who do not, the divide has widened between those able to access internet-enabled services that have become necessary for the citizenry and those unable to do so. Not only does this inhibit access to communication but it also inflates the input cost for business. The

Figure 4 Shape of the Lorenz curve and the Gini coefficient with and without access to the devices



Source: Raw data from RIA (2008)

second reason for the wider inequality between mobile phone users (compared with those who are not connected to the devices) concerns the polarisation of their usage in terms of average revenue per user (ARPU). It was found in 2008 that the range of ARPU for mobile phones in African countries was between US$6 and US$12, while in 2010, the ARPU ranged from about US$2 to US$25, with voice accounting for 33 per cent. This sheds lights on the conclusion that people in the lower socio-economic classes only acquire devices they can afford, whereas the higher income users perceive that value-added services are useful, and thus are prepared to spend money on such services (Kadium Ltd, 2011). Sife *et al.* (2010) reinforce this aspect by pointing out that although mobile phones have enabled rural communities to generate some income, they have not made an important contribution in this regard (in the case of Tanzania).

In terms of expenditure, Diga (2007) reported that the use of mobile phones and other gadgets in Africa impacted on household expenditure on food. This is echoed by Samuel *et al.* (2005) who added that expenditure on mobile phones had reached 15 per cent of the total expenditure. However, Donner (2005) found no causal effect between the adoption of mobile phones and family prosperity in most African countries.

Participation

This section considers whether access to mobile phones and the internet contributes to a higher involvement and participation in the society. Table II explains the relationship.

It can be seen from Table II that, in general, people are not very interested in participating in the decision-making process; only 30 per cent of respondents participated in decision-making. When controlling for access to telecommunications, the proportion decreased even further. Of those with access to a mobile phone, only 23 per cent join in decision-making in their village, and an even lower proportion of internet users (18 per cent) do so.

Although an in-depth study is needed to explain this phenomenon, previous studies may be used to understand the reason behind this finding. For instance, Roco and Sims (2003) state that the recent development of mobile phones and the internet have eroded the traditional way of communicating. The paradox behind the revolution is that technology is steadily eroding the time and attention devoted to communication with people in the immediate vicinity, driven in particular by the fact that the cost of sending an e-mail and/or text is becoming very close to zero. Soon, technology will have conquered geographical separation. In other words, connecting to telecommunication devices may lead to a lower degree of interaction with society.

A Kenyan study provides a different perspective. It was found that the use of the internet and mobile phones in the country had led to not only positive but also negative impacts for the user (Ndung'u and Waema, 2011). Moreover, the decision not to use technology (e.g. a mobile phone and the internet) was based on the perceived benefit or otherwise of the technology. The study discloses that 43 per cent of respondent did not use the internet due to a deliberate choice not to use it. Hence, people who are connected to the internet are not necessarily more knowledgeable than those who are not connected.

Table II Ownership of telecommunication devices and involvement in the decision-making process

	Ownership of devices									
	Mobile phone				*Internet*					
Actively involved in the	*Yes*		*No*		*Yes*		*No*		*Total*	
decision-making process	n	*Per cent*	n	*Per cent*	n	*Per cent*	*n*	*Per cent*	n	*Per cent*
Yes	2,245	23	8,019	35	340	18	6,304	31	6,643	30
No	7,727	77	4,399	65	1,602	82	14,143	69	15,747	70
Total	9,972		12,418		1,942		20,447		22,390	

Source: Raw data from RIA (2008)

Productivity

The next analysis explains the relationship between ownership of a mobile phone and use of the internet in terms of the productivity level. The comparative cross-tabulation results are shown in Table III.

Table III delivers a message that access to telecommunication devices, namely a mobile phone and the internet, has not yet been able to leverage productivity in terms of amount of work. It is found that access to a mobile phone only affects productivity slightly, as the respondents are almost equally divided between those who experienced increased and decreased productivity. Even worse, of the respondents who had access to the internet only 25 per cent recorded an increase in working hours, while 29 per cent of respondents experienced a decrease.

Access to ICT devices does not necessarily mean better economic activity and increasing productivity; this is supported by recent studies in African countries. The studies show that mobile phones are used mostly to maintain social networks, with a weak link to business activities (Molony, 2006). Hence, the adoption of devices is aimed at maintaining a livelihood, with the importance placed on the extended family, given the spread of poverty (Rettie, 2008). The majority of the Ghanaian mobile phone traffic, for example, is aimed at maintaining family relationships (Hahn and Kibora, 2008). In Botswana, more than 60 per cent of phone owners shared a phone with a family member, 44 per cent with a friend and 20 per cent with neighbours, but only 2 per cent charged for the service, which means there are limited efforts to monetise this field by introducing more economical means of access, for instance, by renting out handsets (Carmodi, 2010).

Conclusion and recommendations

This paper is intended to answer the research question of whether access to telecommunication devices, particularly mobile phones and the internet, has led to a better QOL. Of the many indicators and frameworks that can be used to represent the measurement of QOL, three indicators were chosen: income; participation in the decision-making process; and productivity. All the data were obtained from an individual and household survey conducted by Research ICT Africa in 2008 comprising 22,000 households in 17 countries.

Employing the Gini coefficient and Lorenz curve to identify the inequality within countries on the African continent, it was found that access to telecommunication devices has contributed very little to closing the income gap, with the mobile phone having a slightly greater impact than internet access. Polarisation of usage is thought to be one of the reasons that some users have had the benefit of value-added services while the majority of users are still using basic communication services. The impact on self-reported participation and productivity is similar, with no strong evidence that access to both devices is enough to motivate users to be more involved and more productive. Empirical studies across the African region indicate that the main reason for this is the weak connection between access to and usage of the devices, on the one hand, and economic activity, on the other. It must be

Table III Ownership of telecommunication devices and productivity

	Ownership of devices									
	Mobile phone				*Internet*					
	Yes		*No*		*Yes*		*No*		*Average*	
Productivity	n	*Per cent*	n	*Per cent*	n	*Per cent*	n	*Per cent*	n	*Per cent*
Increase	586	26.42	25	12.38	606	25.39	5	14.29	598	25.70
Stagnant	1,055	47.57	87	43.97	1,121	47.96	22	63.86	1 122	46.34
Decrease	577	26.01	90	45.55	660	28.65	8	23.86	701	29.95
	2,218		202		2,387		35		2,421	

Source: Raw data from RIA (2008)

noted that the measurement of productivity could be improved in future surveys. For now, the measurement is based solely on the ''input'' side, namely the incremental hours of work. It may also be important to include a question on salary in determining the results of access to the telecommunication devices.

It must also be explained that in the African context the analysis evaluating the impact of the mobile phone and welfare (income and productivity) at household level will always be subject to endogeneity problems. A higher income and other welfare indicators usually lead to a greater likelihood of accessing telecommunication devices (Muto and Yamano, 2010; Aker and Mbiti, 2010). Therefore, further statistics and econometrics analyses are needed for future studies to ascertain the magnitude of the mobile phone impact after correcting possible endogeneity problems. The findings in this paper could be affected by this aspect, as the whole investigation was based on descriptive analysis.

On the basis of this study, future policy should touch on the problems that concern access to hardware (PC or mobile), networks and a local path as the reason for the usage of telecommunication devices being limited and costing more than in any other region. Some countries have started to realise the importance of a high-cost infrastructure in developing the telecommunications sector. In Botswana is known as a diamond producer, but the deposits are expected to run out in the next three decades. Instead of investing in the agricultural sector, which carries a higher risk due to weather conditions, the country will spend US$870 000 on building a Botswana Innovation Hub, making it a priority to develop technology as a key enabling sector. The government also plays an important role, with one of the prominent ICT projects, Nteletsa, initiated with the aim of enhancing connectivity in the outlying areas to the rest of the world. The i.Patnership programme, with its slogan ''a computer for me'', was also launched to provide affordable computers for civil servants (SAWC, 2011).

Likewise, the introduction of the Djamaa phone scheme in Mali is seen as a strategic solution to the high cost of intake, as it is designated to serve as a communication gateway for remote villages. Having provided the devices at a reduced cost, access and usage are expected to extend beyond conventional voice services and, hence, enable sharing of knowledge, increasing productivity and cultivating business-related telecommunications use.

In relation to the link between telecommunications development and economic activity and, thus, increased productivity and a smaller income gap, lessons learned from some countries could also be replicated. Telkom Kenya and Orange have deployed HSPA + , which gives subscribers high-speed wireless with download speeds of up to 21 Mbps in an attempt to achieve the country's economic blue print, Vision 2030. With the growing interest in eMoney in Kenya, E-solution suites were also initiated, covering government and health initiatives (SAWC, 2011). In other countries (Ethiopia, Ghana, Kenya, Malawi, Mali, Mozambique, Nigeria, Rwanda, Tanzania, Uganda and Zambia), a similar policy has evolved by, for instance, establishing the mFarmer Initiative Fund, which is part of an effort to share the knowledge via the mFarmer ecosystem, enabling acceleration of the provision of high-quality agricultural information through mobile services.

Notes

1. A panel data set on 35 countries in the region during the period 1985–2005 was evaluated using a two-step analysis: a panel unit root test and a co-integration analysis.
2. The measurements of the Gini index and the Lorenz curve are explained as follows. Assuming that the area between the line and the perfect equality of the Lorenz curve is A and the area under the Lorenz curve is B, the Gini coefficient is measured as $A/(A+B)$ (Stiglitz, 1997). Consequently, the coefficient can also be calculated as $= 2A = 1 - 2B$, since $A + B = 0.5$. In addition, if the Lorenz curve is the function of $Y = L(X)$, then the Gini coefficient will satisfy the following equation (1):

$$G = 1 - 2\int_0^1 L(X)dX \quad (1)$$

Moreover, in survey data in which there is a random sample of S consisting of the values y_i, $i = 1$to n, and the index is in ascending order ($y_i \leq y_{i+1}$), the Gini coefficient is formulated as in equation (2).

$$G(S) = \frac{1}{n-1}(n + 1 - 2\frac{\sum_{i=1}^{N}(n+1-i)y_i}{\sum_{i=1}^{n}y_i} \quad (2)$$

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