

The relationship between access to Information and Communications Technology (ICT) and poverty in South Africa



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ABSTRACT

The National Development Plan (NDP) recognises access to Information and Communications Technology (ICT) as a hindrance towards economic advancement in South Africa and lists universal access to broadband services as an enabling milestone towards reducing poverty (National Planning Commission 2011: 149). In many respects South Africa has made tremendous progress with access to basic voice telephony, as a result of the rapid expansion of mobile service providers, mainly due to convenience and the introduction of pre-paid telephony. However, with respect to other elements of ICT, especially access to services that require broadband infrastructure, South Africa has not made much progress over the past decade. The purpose of the paper is to investigate the relationship between access to ICT and poverty in South Africa in order to establish whether any meaningful correlations exist. The paper furthermore attempts to identify those areas in South Africa that are characterised by both high levels of poverty, and low levels of access to ICT. There is a strong negative correlation between the geographic spread of access to ICT and the geographic spread of poverty in South Africa. In other words, areas where poverty are relatively high are areas likely to experience relatively low access to ICT, conversely, areas where poverty are relatively low are likely to experience relatively high levels of access to ICT.

Keywords: Information and Telecommunications Technology, universal service and access to ICT, poverty, underserved areas, broadband services

1. INTRODUCTION

The National Development Plan (NDP) recognises access to Information and Communications Technology (ICT) as a hindrance towards economic advancement in South Africa and lists universal access to broadband services as an enabling milestone towards reducing poverty (National Planning Commission 2011: 149). In many respects South Africa has made tremendous progress with access to basic voice telephony, as a result of the rapid expansion of mobile service providers, mainly due to convenience and the introduction of pre-paid telephony. However, with respect to other elements of ICT, especially access to services that require broadband infrastructure, South Africa has not made much progress over the past decade. Therefore the major challenge is the provision of universal access to broadband services.

Latin American researchers formulated the concept of ‘digital poverty’ to capture the challenge of access to ICT and, where there is access, the ability of individuals to use ICT effectively (Barrantes 2007). Digital poverty comprehensively seeks the association between attributes of connectivity, communication, the generation and consumption of information with ICT use and consumption. Individuals or communities are considered ‘digitally poor’ when economically poor individuals are shut out of the ICT market due to lack of income, that is, people with low income without the ability to use ICT; alternatively people with low income do not have adequate services to enable them to use ICT infrastructure.

The research problem investigated in this paper is the relationship between access to ICT and poverty in South Africa in order to establish whether meaningful correlations can be deduced. This is undertaken by *inter alia* identifying those areas in South Africa that are characterised by both high levels of poverty, and low levels of access to ICT.

2. THE RELATIONSHIP BETWEEN ICT AND POVERTY IN ACADEMIC LITERATURE

Poverty needs to be understood in its multitude of dimensions. It is not sufficient to explain poverty only in terms of income and consumption (Alkire 2007; Alkire and Foster 2007; Basarir 2011). Von Maltzahn and Durrheim (2008:27) argue that ‘multidimensional measures provide insight into particular elements of poverty that is useful and relevant to poverty interventions’.

Poverty has various manifestations, including lack of income and productive resources sufficient to ensure sustainable livelihoods; hunger and malnutrition; ill health; limited or lack of access to education and other basic services; increased morbidity and mortality from illness; homelessness and inadequate housing; unsafe environments; and social discrimination and exclusion. It is also characterised by a lack of participation in decision-making in civil, social and cultural life. Definitions broadly fall into two main groups: one based on resources (income and expenditure) and one based on social indicators of full participation in society. The resource-based definition of relative poverty usually refers to the bottom 20 to 40 per cent of the expenditure distribution (May 2010).

Technology has both deepened and accelerated the world’s interconnectedness, enabling higher growth, a leap in trade, and an even larger surge in cross-border investment. It is likely that the pace will quicken further over the next two decades as information flows, capital movements, trade and migration speed up (National Planning Commission 2011: 45). There is an increased level of interest being shown in ICT within the developmental context (Thomson 2008) as a way of addressing poverty in developing countries. According to Heeks (2010: 626), in 1998, one in every 100 inhabitants in a developing country was an internet user. By 2008, that figure was nearer to 15 in every 100, growing annually by 21 per cent. The rise for mobile phones has been even greater: the number of subscriptions was equivalent to 2 per cent of the developing world’s population in 1998, ten years later, in 2008, that figure had risen to 58 per cent, increasing annually by 55 per cent. Estimates suggest that actual ownership of mobiles might be around three-quarters of the subscription rates, but that actual usage might be twice that figure due to shared usage of mobile phones. These estimates suggest that usage of mobile phones exceed 80 per cent of the population of developing countries.

According to Sen (1999: xii), ICT is seen as a crucial enabling infrastructure for future progress within four developmental indicators: economic opportunities, political freedoms, social facilities and transparency guarantees (Thomson 2008). Heeks (2010) provides a useful overview of the contribution of different 'policy arenas' and theoretical frameworks that contributed to the analysis of the contribution of ICTs to development. Heeks (2010) identifies the following approaches within the development studies paradigm:

- development as economic growth;
- development as sustainable livelihoods; and
- development as freedom.

These areas are discussed below:

2.1 ICT and development as economic growth

Development as economic growth follows the classical model of return on investment which is gained through productivity and efficiency gains, increased employment and added value using the traditional measurement of gross domestic product (GDP). This approach is similar to the resource-based approach and an over-reliance on economic growth to address poverty.

There is a body of evidence mainly from the developed economies that ICT makes a substantial contribution to economic growth, as measured by GDP. Holt and Jamison (2009), in a review of research of the contribution that broadband ICT makes to the economy in the USA, explain that various studies analysed this question as the contribution of ICT proliferation to GDP growth, with several authors (Crandal, Lehr and Litan 2007) making the case for substantial growth in both GDP and employment. In fact, Crandal *et al.* (2007) claim that one percentage growth in access to broadband ICT in the USA would result in an increase of about 300 000 employment opportunities.

Kelly, Mulas, Raja, Qiang and Williams (2009: 16) argue that 'the contribution of broadband to economic growth is indeed substantial, and may be more profound than comparable narrowband or voice-based ICTs, providing a boost of 1.38 percentage points on GDP growth in developing countries for every ten percentage points increase in access to broadband'.

Sen (1983b) argues that economic growth makes a contribution to development, but that 'growth is not the same thing as development'. He argues that, ultimately, the process of economic development has to be concerned with what people can or cannot do, for example, whether they can live long, escape avoidable morbidity, be well nourished, be able to read and write, take part in literary and scientific pursuits and, pertinent to this study, communicate.

It is generally accepted that the expansion of access to ICT contributes to poverty alleviation. Jensen (2007) explains through the story of the fishermen of Kerala in India how the adoption of mobile phones between 1997 and 2001 improved access to information about weather conditions and market prices and thus contributed to the improvement of the welfare of the fishermen and the consumers.

Kenny (2001: 1) argues that ‘the growing gap in the provision of advanced ICTs should be of concern’. The gap for advanced ICTs is growing at the same time as other determinants of poverty such as access to education and other social services are narrowing. He argues that weak ICT infrastructure will compromise competitiveness and in turn constrain export-led development programmes. In addition, if new ICT expansion is limited to those who can afford it, it will contribute to expanding inequality along racial and gender lines.

Barrantes (2007) establishes four levels of ‘digital poverty’, which is described as:

- Extremely digitally poor people – people with no or very little access to new ICTs, that is, only access to Radio and TV.
- Digitally poor people – defined as people with access to radio and TV as well as to voice telephony (either mobile or fixed or both).
- Connected people – people with access to internet and email and who have access to computers.
- Digitally wealthy people – people who have full access to high-speed internet and/or are able to interact digitally to access e-government resources, on-line business services as well as creating their own content.

Based on a study in four African countries, May (2010) concludes that the use of a modified version of digital poverty and the analysis of multi-dimensional measures of poverty improves the estimation of predictors of ICT access. He found that households without ICT access are poorer in all dimensions of poverty than those households with access to ICT. This is so especially for those dimensions of poverty that relate to education, access to services and economic assets. He states that this was an important step forward in measuring the impact of ICT on the alleviation or eradication of poverty.

2.2 ICT and sustainable livelihoods

Molla and Al-Jaghoub (2007) show that the contribution of ICT to development is primarily through the contribution to improvement in the livelihoods of households or communities. This is achieved through the enablement of new assets and the generation of additional resources for the household or the community using ICTs.

Grunfeld *et al.* (2011: 160) argue that ‘The use of ICTs would in turn strengthen capabilities, empowerment, and the ability to maintain sustainable livelihoods.’ While they emphasise the positive (upward) spiral application of ICTs in the development process, one can make a case for the negative (downward) spiral as well, as is evidenced in the case of the impact of ICT’s on pornography and other cyber-crimes.

2.3 ICT and development as freedom

The Nobel laureate, Amartya Sen, extensively criticised the over-reliance on resources and classical indicators for economic growth whereby development and poverty is explained. Sen (2004) introduced the concept of the capability approach as a theoretical framework for analysis

of inequality and poverty. The capability approach is based on the central concepts of capabilities and ‘functionings’. Capabilities are defined as the freedom to live a life that is valuable and in accordance with the value as determined by the individual. ‘Functionings’ are the ‘beings and doings’, for example, to be healthy or well-fed or able to read and write. Thus the capabilities of an individual are the means or freedom to realise the ‘functionings’. Robeyns (2006) explains that in the capability approach ‘the focus should be on what people are able to be and to do, and not on what they can consume, or on their incomes’.

Sen (1987) casts his capability approach as ‘development as freedom’, which acknowledges that individuals and communities have choices if they are empowered by capabilities and can choose a life which is valuable to them. Kleine (2010) acknowledges that ICT and the development of the internet and associated broadband services provide exactly that, and that these shift empowerment to the individual and the community. She demonstrates this visibly in relating the story of an individual woman in Chile, who through the services of a telecentre can realise a lifetime dream of visiting Kaiserslautern in Germany, by doing so virtually.

Kleine (2010) argues that the theory of choice is critical to operationalise the capability approach. The framework is used to break ideologies down, to assess the development goals and to map a systematic process that will result in projects and programmes that give the individual or community freedom to choose a life valuable to them.

3. THE SOUTH AFRICAN CONTEXT: UNIVERSAL SERVICE AND UNIVERSAL ACCESS

3.1 The South African Constitution

The Constitution recognises a symmetry between the right to consume (receive) information and the right to produce (impart) information. This is a vital acknowledgement of the rights of citizens. However, the right to consume or produce information may be restricted by access to ICT infrastructure. The Bill of Rights acknowledges this symmetry of the right of every citizen ‘to receive’, that is to consume, ‘information and ideas’ and the right to ‘impart’, create or produce ‘information and ideas’.

Defining universal service and universal access is a moving target – in the mid-1990s the emphasis was on universal service in fixed line telephony; it has since moved to mobile and more recently broadband services (Benjamin and Dahms 1999; Msimang 2006.)

In February 2010, the Minister of Communications published a determination that defined Universal Service as follows:

[U]niversal service for electronic communications services is provided where all persons, if they require it, are able to obtain quality, affordable and usable access to a minimum set of electronic communications network service and electronic communication service, on either a household or individual basis, including a voice and data electronic communications service and, in the case of data, including a broadband connection, and access to emergency services using free calls and messaging, where all services are offered on a non-discriminatory basis (Department of Communications 2010).

The minister also defines ‘universal service for broadcasting services, as where all persons have access to a diverse range of television and sound broadcasting services ... that cater for all languages and cultural groups, including persons with disabilities, and which provide entertainment, education and information’.

The Universal Service and Access Agency of South Africa USAASA (2008) defined ‘an underserved area as ... any municipal area or ward within a metropolitan municipality where the average electronic communication network service penetration is below the national average penetration rate’.

In October 2011, The Independent Communications Authority of South Africa (ICASA) published a notice in the Government Gazette of its intention to make regulations in relation to underserved areas. In the General Notice an underserved area is defined as any area within a local or district municipality in which:

- no electronic communications network has been constructed; or
- an electronic communications network has been constructed, but where there is no, or limited coverage in inhabited parts of the area, or
- an electronic communications network has been constructed, but over which no, or limited electronic communications services or broadcasting services are being provided, as determined by the authority from time to time.

ICASA (2011) published two lists of penetration rates for electronic communications services and for broadcasting services for each of the district councils and local municipalities. The main source of the data is the Community Survey conducted in 2007. Electronic communication services consist of household access to mobile, landline, internet and computer services for local authorities, while broadcasting services consist of household access to radio and television services for district councils. The penetration rate of each household item is recorded and then an average is calculated for electronic communications services and broadcasting services. A national average is then established and district councils and local municipalities below this level are determined as underserved.

With respect to broadcasting services, the national average for district councils was determined as 60.5% for access to television and 73.8% for access to radio, which yields a national average of 67.2%. Of the 52 district councils, 23 were found to be below the national average.

The national average for electronic communications services was recorded as 28.5%. This is made up of access to internet (7.2%); computer (15.6%); landline (18.5%) and mobile (72.7%). Of the 252 local municipalities, 199 were found to be below the national average.

3.2 The National Development Plan

The National Development Plan (2011) states that compared with the best international standards, South Africa’s ICT infrastructure is abysmal and in need of an efficient information infrastructure that promotes economic growth and greater inclusion. ICT has changed radically

over the past two decades since the entry of mobile phones in 1993 up to findings in 2010 that 70% of individuals in South Africa have access to a mobile phone or a simcard (National Planning Commission 2011: 170). Despite these figures, general growth in South Africa's ICT sector has not brought affordable, universal access to the full range of communication services throughout the country, and poorer communities suffer most in gaining access to this market.

The vision of the National Development Plan for ICT (National Planning Commission 2011: 170) states that 'by 2030, ICT will underpin the development of a dynamic information society and knowledge economy that is more inclusive and prosperous'. It is envisaged that the networks, services, applications, content and innovation put in place as part of ICT infrastructure will support economic growth, development and competitiveness, create decent work, support nation-building and social cohesion as well as local, national and regional cohesion. ICT as seen by the NDP is an enabler – it can speed up delivery, support analysis, build intelligence, and create new ways to share, learn and engage (National Planning Commission 2011: 171).

The following section attempts to identify the relationship between poverty and access to ICT in South Africa, in order to identify those areas in greatest need for investment in ICT infrastructure as proposed by the NDP.

4. METHODOLOGY AND DATA ANALYSIS

This research report is based on data from the Community Survey conducted by Statistics South Africa (Stats SA) in February 2007 and focuses on the 52 district councils in South Africa. The following statistical and spatial statistical techniques were applied to evaluate the relationship between access to ICT and poverty in the district councils:

- a. Correlation: In this statistical tool the direction and strength of the relationship/ association between two variables are determined statistically. For the purposes of this research a multivariate correlation method (more than two variables) was used;
- b. Spatial Autocorrelation: A spatial analytical tool that measures feature similarity (location and value taken into account) and measures whether the pattern of feature values is clustered, dispersed, or random;
- c. Hotspot Analysis: This spatial analytical tool indicates where hot spots (clusters of high values) or cold spots (clusters of low values) exist in an area. The centroid is computed by using the weighted mean centre of each feature. To be statistically significant, the hot spot or cold spot will have a high/low value and be surrounded by other features with high/low values.

The poverty indicators that were used relate to aspects that would indicate a low level of income are income levels, no access to electricity, limited access to water, limited access to formal sanitation and living in informal housing.

4.1 Correlation between ICT and poverty indicators

The poverty indicators mentioned above have been compared with the ICT indicators to determine whether there is a correlation between each of the poverty indicators and each of ICT indicators.

- Low income vs. access to ICT: The proportion of households with an annual income below R19 200 was compared with their access to ICT. Correlation of poverty indicators with access to mobile phones is weak (-0.3200). Similarly, the correlation between income below R19 200 and ownership of a radio is moderately weak at -0.6861, whereas there is a strong negative correlation with access to telephones (-0.8932); computers (-0.8912); internet (-0.8672) and television (-0.8329).
- No electricity vs. access to ICT: A comparison between the proportion of households with no access to electricity for lighting and those with access to ICT was made. Once again the correlation with mobile phones is weak (-0.2138) Also, the correlation for telephones (-0.6402), computer (-0.6395), radio (-0.6236) and internet (-0.5450) is moderately weak. There was a strong correlation with television (-0.8852).
- Informal housing vs. access to ICT: A similar trend is evident in informal housing as in households with no electricity. Access to mobile phones is weakly correlated (-0.1240). The following were moderately negatively correlated: internet (-0.4304), computer (-0.5202), telephone (-0.5538) and radio (-0.6426). A strong negative correlation was recorded for television (-0.7888).
- Limited access to formal sanitation vs. access to ICT: Mobile phones are weakly correlated to limited access to sanitation services (-0.1576). There are relatively strong correlations with the other ICT services: telephone (-0.8764), television (-0.8692), computer (-0.8368), internet (-0.7949) and radio (-0.7037).
- Limited access to water vs. access to ICT: Mobile phones are weakly correlated to limited access to water (-0.1720). There are relatively strong correlations with the other ICT services: telephone (-0.9218), television (-0.8995), computer (-0.8704), internet (-0.8382) and radio (-0.7708).

The weak correlation of mobile phones to all poverty indicators seems to suggest that access to a mobile phone is not dependent on income levels or access to basic services. However, the moderately weak to strong correlation with all other forms of ICT, that is, radio, television, computer, internet and telephones suggest that a low level of income, having limited access to basic services infrastructure and an informal dwelling significantly reduces a household's chances of having access to these forms of ICT.

4.2 Spatial analysis

Spatial autocorrelation revealed the following frequencies of the poverty indicators throughout the 52 District Councils:

Income: District councils with the highest number of households with an income lower than R19 200 per annum vary between 58.8% and 64.9%, while district councils with the lowest number of households with an income lower than R19 200 vary between 21.2% and 26%.

Informal dwelling units: District councils with the highest number of informal dwelling units vary between 59.9% and 73.3%, while district councils with the lowest number of informal dwelling units fall between 3.2% and 7.2%.

No electricity: District councils with the highest number of households with no access to electricity vary between 50.8% and 66.4%, while district councils with the lowest number of households without access to electricity fall between 4.3% and 6.9%

Limited access to water: District councils with the highest number of households with limited access to water vary between 85.6% and 95.6%, while district councils with the lowest number of households with limited access to water vary between 13% and 22%.

Limited access to sanitation: District councils with the highest number of households with limited access to sanitation are between 81.6% and 94%, while the district councils with the lowest number of households with limited access to sanitation fall between 6% and 7.2%.

Figure 1 illustrates these frequencies as hot and cold spots i.e. hot spots with the highest percentages of each of the five poverty indicators (the districts coloured in shades of red) and cold spots with the smallest percentages of the poverty indicators. Most of the hot spot district councils are located in the provinces of KwaZulu Natal, Eastern Cape and Limpopo.

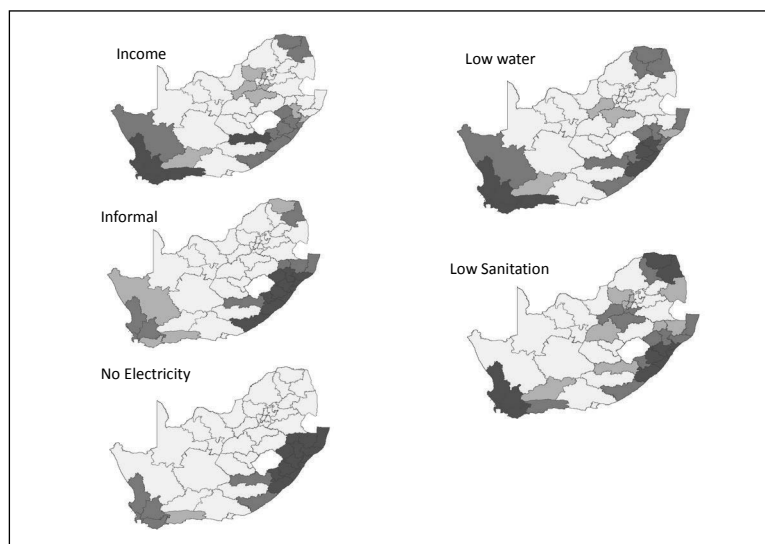


Figure 1: Hot spot analysis of the poverty indicators.

Spatial autocorrelation revealed the following frequencies of access to ICT in households by district:

Radio: In the district councils with the lowest number of households with access to radios approximately 57% of all households have such access. In the district councils with the highest number households with access to radios, the share of such access ranges between 82% and 84%.

Television: In the district councils with households with very little access to TVs, such access were recorded between 31.7% and 37.2%, while the district councils with households with access to TVs recorded access between 79.8% and 85.9%.

Mobile phones: In district councils with the lowest number of households that have access to mobile phones, such access vary between 55.4% and 56.6%, while in district councils with the highest number of households with access to mobile phones access is between 77.6% and 83.3%.

Telephone: In district councils with the lowest number of households who have access to fixed line telephony such access are between 1.4% and 2.3%, while in the district councils with the highest number of households with access to fixed line telephony the level of access varies between 37% and 47%.

Computer: The district councils with the lowest number of households with access to computers recorded access between 1.6% and 2.4%, while the district councils with the highest number of households with access to computers note access between 26% and 34.3%.

Internet: The district councils with the lowest number of households with access to the internet reflect access between 0.4% and 1%, while in the district councils with the highest number of households with access to the internet such access varies between 10.5% and 18.9%.

Figure 2 illustrates these frequencies as hot and cold spots, that is, hot spots with the largest percentages of household access to ICT (the districts coloured in shades of red) and cold spots with the smallest percentages of household access to ICT. In this instance most of the cold spot district councils (districts with low levels of household access to ICT) are located in KwaZulu-Natal, Eastern Cape and Limpopo.

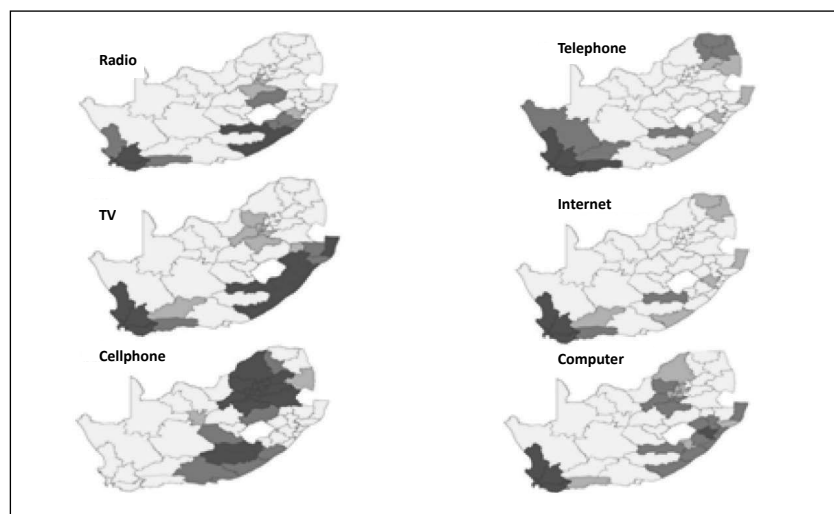


Figure 2: Hot spot analysis of household access to ICT

4.3 Determination of under-serviced areas

The spatial analysis identified the district councils with high poverty and low access to ICT, which could be classified as under-serviced areas. In Figure 3 below results are presented in a manner that makes it easier for comparison. It is clear that the hot spots in the poverty indicators (areas with high levels of poverty) compare well with cold spots for access to ICT (areas with low levels of access to ICT). The only exception is the cold spots for mobile phones that do not compare well with the same geographic area as the hot spots for the poverty indicators, reinforcing the notion that having a low level of income; informal housing and limited services infrastructure do not preclude access to a mobile phone.

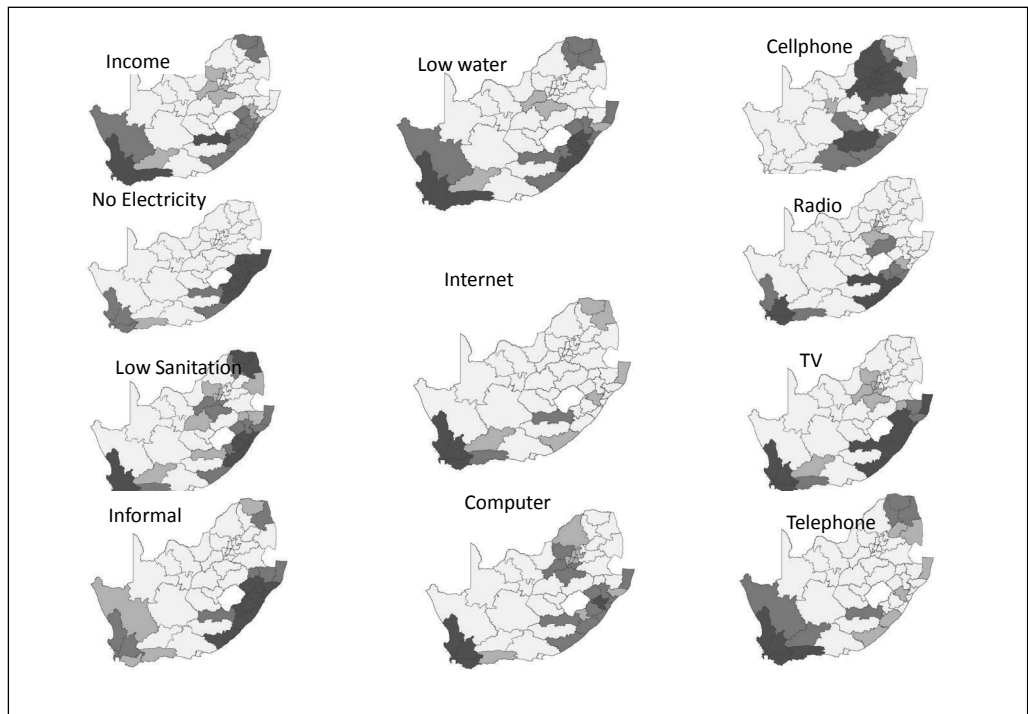


Figure 3: Overview of hot spot and cold spot analysis of poverty indicators and access to ICT

5. CONCLUSIONS

According to Heeks (2010), there are three ways in which ICT can contribute to development:

- Development as economic growth, suggesting that ICTs are both saving money and making money for those from low-income communities (see, inter alia, Abraham 2007; Levy *et al.* 2010);

- Development as sustainable livelihood, showing that ICTs enable the development of additional livelihood assets, the enactment of new livelihood strategies and therefore produce livelihood outcomes; and
- Development as freedom, illustrating that ICTs increase capabilities and functionings of people in developing countries.

This paper illustrated a strong negative correlation between poverty indicators (low income, informal housing, access to basic services) and ICT indicators (access to mobile phones, telephone, television, radio, computers, and internet) in South Africa. Thus, where poverty indicators are high, access to ICT is low. Conversely it can be concluded that there is a strong correlation between district councils in South Africa that have a high number of households with access to ICT with district councils that measures a low proportion of households on poverty indicators.

The vision and objectives stated by the NDP in terms of the development of ICT in South Africa, read in conjunction with the statements by international authors on the contribution of ICT to development, highlight the importance of targeting specific areas for ICT investment. Since the research revealed that areas with limited access to ICT also corresponds to areas experiencing the highest poverty levels, it is clear that these are the areas where investment in ICT will yield the biggest return on investment, and where such investment can act as a catalyst for poverty alleviation that is so desperately needed.

NOTES

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