**Articles**

# Government Public Access Centres (PACs): A beacon of hope for marginalised communities

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*Notwithstanding massive injections into broadband infrastructure, large sectors of the world's population remain without access to the internet. One of the strategies employed by government and the private sector to address the digital divide has been to provide basic computing services and internet access to communities in the form of public access centres (PACs), otherwise known as telecentres. Over the years, PAC related interventions have been subjected to much introspection and critique given a number of examples of failures. This paper examines a PAC program in South Africa which has been running successfully since 2003. The paper reports on a study which includes data collected from more than 2400 users of PACs. The findings provide critical insights into the value proposition of PACs for communities in impoverished areas and whether this approach is still relevant from a policy perspective to tackle the digital divide. The findings also provide insights into the profile of users; the factors which impact on their choice of a PAC as an internet access point; and the extent to which there is a reliance on PACs. The most revealing finding from the study indicates that PACs provided the average user with something more than just an internet access point. The study has determined that PACs have a significant effect on the hopefulness a citizen has for his or her self, community and country.*

## Introduction and background

Since the two-phased (Geneva in 2003 and Tunis in 2005) World Summit on Information Society (WSIS), we have witnessed a proliferation of activity across the African continent in which governments have been hard pressed to create enabling policies to realize the goals of the Information Society. Telecommunications operators, including the incumbents, continue to invest in infrastructure in a bid to expand services, and gain market share. Much of this effort is driven by the need to expand access to the internet via broadband networks to as

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many citizens as possible, and, in the main, to serve for-profit motives. A key concern related to this expansion is the alignment of infrastructure expansion with the notion of development on the African continent for the people for whom this infrastructure is targeted. Despite the massive strides made in rolling out telecommunications infrastructure and electronic networking, the International Telecommunication Union (ITU) reports that in 2014, 44 percent of the world will be online and 4 billion people remain unconnected. Of those who remain unconnected 90 percent of them are from the developing world (ITU, 2014b).

Given the foregoing, government and the private sector have been engaged in a number of programmes for more than a decade to provide basic computing services to communities in the form of public access centres (PACs), otherwise known as telecentres, in terms of earlier definitions in the literature (e.g., Parkinson & Ramírez, 2006; Islam & Hasan, 2009). Recent studies have affirmed the benefit of PACs. Clark, Sey and Sullivan (2012), in a comprehensive five-year study of PACs in five developing countries, found that: public access venues are a critical gateway for developing skills among the public; users of PACs also develop digital literacies in public venues; private access is not necessarily a substitute for public access, with unique benefits reported by users at PACs, thus many users continue to use public access venues despite having access elsewhere; and public access impacts lives in terms of income, social connections, education, amongst others.

In light of this, governments, especially in developing countries, will need to assess how to bring the 3.6 billion unconnected people on board the Information Society. Will, for example, models of community-based access to the internet, as opposed to individual access, continue to be a solution? What are the typical profiles of PAC users? Does community-based access via Public Access Centres (PACs) provide the intended benefits? The objective of this paper is to provide some insights to these vexing questions given the fact that the PAC model continues to dominate, especially in developing countries agendas. This paper pursues these broad questions by examining the South African situation, and its associated government-driven PAC related programmes.

## South African digital divide context

In the South African context, only 21.4 percent of households (Figure 1) have access to a computer (Statistics SA, 2012)[1], and 10.8 percent of households (Figure 2) have access to internet at home (Statistics SA, 2015). Indeed, there is much excitement with regards to the high penetration levels of mobile phones in South Africa with 88.9 percent of households having access (Statistics SA, 2012). Notwithstanding, it is sobering when one considers that only a small minority of mobile phone users are able to afford access to Internet and related World Wide Web (WWW) services via their mobile devices.

A huge barrier to broadband and communications services in South Africa relates to affordability. South Africa ranks 104th out of 144 countries in terms of affordability of communications services (WEF, 2013).

[1] The most recent Census in South Africa was conducted in 2011, and published in 2012. The General Household Survey of 2014 showed no increase in the number of households owning a computer.

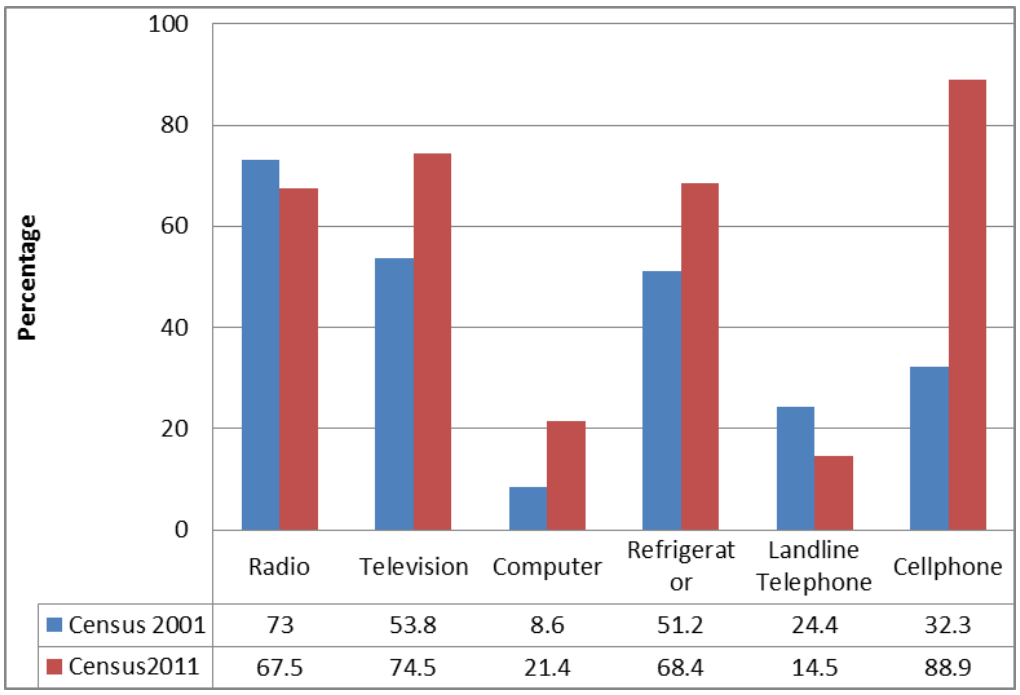


Figure 1: Household Goods in Working Condition (Source: Statistics SA, 2012)

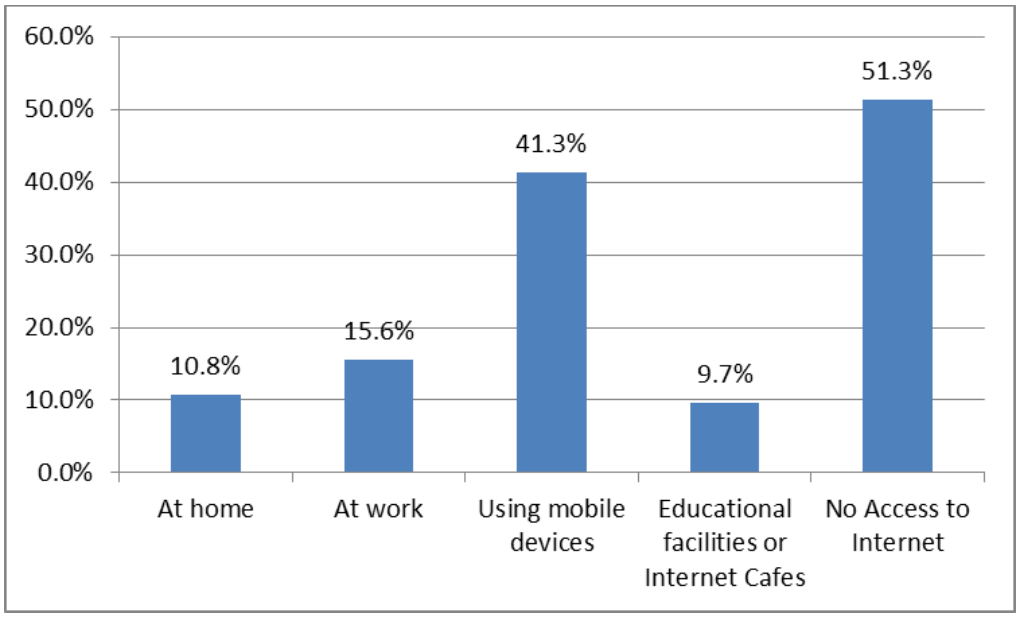


Figure 2: Percentage distribution of South African households with access to the internet in 2014 (Source: Statistics SA, 2015, p. 53)

## South African Government policy and related initiatives

Like many other countries, South Africa has also pursued a PAC model as one of its strategies to address the digital divide, since the late 1990s, with varying degrees of success. The programmes to ensure the provision of PACs, from a national government perspective, have been the mandate of the Universal Service and Access Agency of South Africa. The latter is a

statutory body created through the promulgation of the Electronic Communications Act of 2005[2], and based upon government's vision of creating a South African Information Society, as framed in the cabinet endorsed Information Society and Development Plan (ISAD) plan (DoC, 2007). At lower levels of government there are also examples of PAC programmes, such as the City of Cape Town's Smart Cape program (http://www.smartcape.org.za/about.html), the City of Johannesburg's Public Access to Internet in Libraries (PAIL) programme (http://www.gautengonline.gov.za/News/Pages/CityofJoburglaunchese-World.aspx), and the Western Cape Government's Cape Access programme (https://www.westerncape.gov.za/capeaccess/e-centres).

Currently, there is a sense of urgency around which the government is focused on the rollout of telecommunications infrastructure in a bid to ensure access to broadband Internet. With the landing of two more undersea cables on the shores of South Africa in the past three years, there is ample international bandwidth currently to serve the population. Other noteworthy actions which are unfolding include: the formation of a government and industry partnership and the signing of a job competitiveness compact in 2011 which targets a 100 percent broadband penetration and the creation of 1 million jobs in the ICT sector by 2020; the adoption of an Integrated National Broadband plan, SA Connect, in December 2013 (SA Connect) which targets the building of an information society, lowering the prices of broadband access, increasing uptake and usage, and the liberalization of the South African ICT sector to promote competition; the establishment of the Ikamva National e-Skills Institute to attend to the dearth of e-skills; a clear intention by the regulator to attend to the efficiency of spectrum planning; and lastly the escalation of broadband infrastructure rollout as a key Presidential Infrastructure project (DTPS, 2013).

In addition to this, the government recently released a set of ICT policy recommendations as a pre-cursor to the development of a National Integrated ICT White Paper. Given that the policy recommendations are forward looking, the role of PACs is further entrenched in these recommendations. This includes recommendations that "*within a period of five years at least one technology hub should be developed in each of the country's major cities, where these do not currently exist, focusing on inner cities and townships*" and that "*these hubs should be able to operate as a hub and spoke model with community ICT access centres" which should support "grassroots and community-based innovation*" (DTPS, 2015: 134-135).

**Research problem**

Whilst all of the foregoing initiatives are well intended, the issues of dealing with ICT infrastructure without considering how to ensure uptake, adoption and the nature of benefits, are well documented in the literature. It is therefore incumbent upon the research community to support government in its quest to realize the goals of an Information Society. In this regard, it is noted that PACs remain firmly on the South African agenda as a means to address the digital divide. One of the questions, thus, in respect of the various PAC programs at both national and local levels in South Africa concerns the sustainability of such centres and an understanding of the benefits of such public facilities and their contribution to the development of communities. Without an innate understanding of this, we may perpetuate the

[2] The Agency initially existed as the Universal Services Agency, which was promulgated through the Telecommunications Act of 1996.

folly of treating the PACs programs as infrastructure issues, without any alignment to developmental goals.

This paper therefore contributes to the discourse in respect of the PACs, and its role in ensuring development amongst needy communities. There are only a few studies which have provided a deeper insight into the development notions of PACs in the South African context (e.g. Rhodes, 2009; Attwood & Braathen, 2010; Gomez, Pather & Dosono, 2012; Pather, 2012). This paper reports on an investigation into one of the successful South African PAC programs based in the Western Cape viz. Smart Cape. The specific objectives of the research reported herein are:

- To assess the value proposition of PACs for communities in impoverished areas of South Africa and whether this is still relevant as a policy position to tackle the South African digital divide;
- To understand the profile of users, and the factors which impact on their choice of a PAC as an internet access point;
- To assess the extent to which there is a reliance on PACs;
- To obtain insight into the benefits of a typical PAC, and in particular whether PACS provided the average user with something more than just an internet access point.

The remainder of the paper is organised as follows: the next section provides a review of literature associated with PACs, followed by an overview of the Smart Cape Program. Following on this the details of the research design and mode of analysis are described, after which the key findings are presented.

## Literature Review

The extant literature encompasses a fairly large number of issues. However, before delving into some of the pertinent background and critique of PACs, it is relevant to first examine the notion of ICTs and development, given that this is the fundamental goal of government policies in respect of PACs.

### ICTs and development

One of the primary aims of PACs is to promote development especially at grassroots community level. Global experts assert that socio-economic development today is determined by the ability to establish a "synergistic interaction between technological innovation and human values" (Castells, 1999). In other words, it can be said that there is an interrelationship between cultural and educational development which in turn conditions technological development, which then conditions economic development. This, in turn, conditions social development, and that development stimulates cultural and educational development once more (Castells 1999). There is also an emerging consensus indicating that the use of ICT can effectively assist socio-economic development, and indications that ICT skills are increasingly fundamental to all.

Similar to developed and industrialised countries, developing countries are continuously subject to the transformation of the technological organisation of society. This is largely due

to the development and diffusion of modern technologies, which are supported and furthered by national and regional policies including the setting up of a large number of technology-advancement programs (Hofkirchner, Fuchs, Raffl, Schafranek, Sandoval & Bichler, 2007).

The usefulness of contemporary ICT can be seen in its ability to access, adapt, and create new knowledge for social, political, and economic development purposes (Warschauer, 2003). In other words, ICTs are seen as tools for accelerating socio-economic development as technology per se does not solve socio-economic problems.

The availability of ICT can be seen as a pre-requisite for economic and social development. Early econometric studies reported a statistical relationship between diffusion of information technology, productivity and competitiveness for countries, regions, industries and firms (Dosi, Freeman, Nelson, Silverberg & Soete, 1988). Other later studies also confirm the capability of ICT to support socio-economic development (Munyua, 2000; McIver, 2003; Taylor, 2004; Mitrovic, & Bytheway, 2006; Gurstein, 2007)

The conviction that ICT can support socio-economic development was also a central theme of the World Summit on the Information Society (WSIS) held in Geneva in 2003 and Tunis in 2005 (http://www.itu.int/wsis/index.html). The Millennium Declaration has acknowledged that ICT are important in achieving the overall Millennium Development Goals by, for example, improving the delivery of education and healthcare, or making government services more accessible (WTD, 2003).

In the past twenty years, massive strides have been made in harnessing the benefits of the Internet for commerce and industry. However, at a societal level, the digital divide remains a harsh reality facing the modern world. Worldwide trends indicate a positive growth rate in individual use of the Internet. Data from the International Telecommunications Union, for example, show a 600 percent increase in individual use of the Internet over a six year period since 2005 in Africa. A similar trend is observed in South Africa (see Figure 3).

However, large sectors of society are still unaware of the benefits of modern Information and Communication Technology (ICT). This is also true in South Africa where the government has prioritised economic development policies (South Africa., 2002) since the country still has a very inequitable society characterised by a range of developmental levels (Langa, Conradie & Roberts, 2006). The South African government viewed opportunities presented by the use of ICT as one of the means by which economic growth can be sustained. Although South Africa performs far above the African average, we unfortunately have about half the average penetration rate as compared to the average worldwide. Given this scenario, and the current high costs of access to broadband internet, the role of PACs remains quite important to address the digital divide.

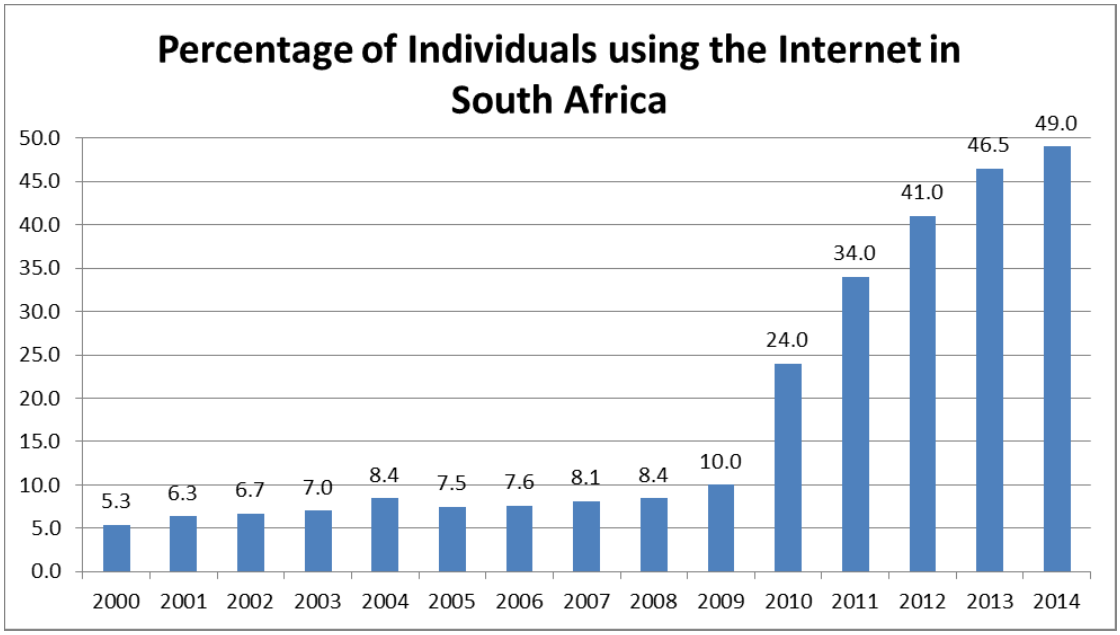


Figure 3: South Africa: Percentage of Individuals using the Internet in from 2000 to 2014 (Source: ITU (2014))

**Public access centres**

The importance of access to ICT as a means for development was recognized as long ago as 1980 with the commissioning of a report by UNESCO that identified the need for a more equitable allocation of resources in the field of communication (UNESCO, 1980). A number of stakeholders worldwide had committed large resources to provide access to ICT to underserved communities. They developed "places" or "spaces" where community members could have access to computers, and specifically to networked computers. The places are called "multi-purpose centres" or telecentres or "public access centres". Because of the ability to give the necessary access to information, these public access centres, such as telecentres, have been "hailed as the solution to development problems around the world". Close to the end of the previous century, Benjamin and Dahms (1999: 57) pleaded for the need for entities such as telecentres to be vehicles for access and information dissemination and not to be seen as technology for technology's sake only.

Public access centres afford underserved communities access to the Internet to reach the following objectives (Clement, 2004: p. 8):

- to decrease the digital divides,
- to enhance the economic, social, political cultural capabilities of the community
- to enhance the creation of local content
- to provide specific online services to the communities
- to enhance effective use of ICTs

In 2004, underserved communities accounted for 80 percent of the world's population who were not able to access ICTs while Internet access at one's home had almost become the

norm in the developed communities (Rothenberg-Aalami &, 2005: 2). The ITU found that only 40 percent of the world's households had Internet access at their homes by 2013 (ITU, 2014: 11) and further estimated that only 31 percent of households in developing countries will have Internet access at their homes by end 2014 (ibid.). Given this low level of Internet access to households in developing communities, access to the Internet via public access centres is of critical importance since it is the only way for millions of people to have access to computers and the Internet for various services to be part of the information society (Huerta & Sandoval Almazán, 2007: 218; Chigona, Lekwane, Westcott & Chigona, 2011; Sey, Coward, Bar, Sciadas, Rothschild & Koepke, 2013).

Thus telecentres, multipurpose centres, ICT centres or areas with computers in libraries, often supported by governments, NGOs or other development agencies, have been implemented in many countries to enable access to ICT and Internet, where individual access is impossible freely or at least very cheaply (Colle, 2000; Harris, 2001). Although there are many definitions and explanations of telecentres, the overarching role is given as giving public access to ICTs (Gómez, Hunt & Lamoureux, 1999). Reilly and Gomez (2001: 1) defined telecentres as

> *"...physical spaces that provide public access to information and communication technologies, notably the Internet, for educational, personal, social and economic development."*

James (2006: 342) defined telecentres as "donor-funded community access points", which offer Internet access and other technologies to communities; some in rural areas and some in underserved peri-urban and urban areas. Because of the ability to give necessary access to information, telecentres have been "hailed as the solution to development problems around the world" (ibid.).

Many countries have launched projects within the public access centre sphere to address various needs of the specific communities that they serve. A report of a study done in the Asia and the Pacific region demonstrates the emphasis of projects run by public access centres. These are:

- develop small businesses
- promote e-governance
- promote self-employment
- promote telecentre operations
- provide fishery information
- create employment for youth
- empower women entrepreneurs
- facilitate access to government services
- implement e-health programmes
- promote rural marketing

- provide access to online learning material
- provide training for teachers/students
- promote e-literacy
- ensure universal access to ICT
- provide agricultural information (Ariyabandu, 2009, p. 7)

This demonstrates the emerging role of public access centres as "knowledge hubs". Ariyabandu (2009: 4) defines knowledge hubs as

> *"...a vibrant centre regularly accessed by the community for their development and livelihood needs."*

Ariyabandu further advocates for transformation of public access centres to knowledge hubs, in order to unleash the potential to bridge the digital divide as well as the economic, social and gender divides which are polarizing society.

Telecentres also serve as community centres where community members can access the Internet, meet to talk, share experiences, as well as being utilised as computer literacy training facilities (Rothschild, 2008: 7). However, public access centres have a primary role to give underserved communities access to ICTs (Gómez, Hunt & Lamoureux, 1999: 3) and are defined to be:

> *"physical spaces that provide public access to information and communication technologies, notably the Internet, for educational, personal, social and economic development (Gomez & Reilly, 2001: 1)."*

Because of the ability to give necessary access to information, telecentres have been "hailed as the solution to development problems around the world" James (2006: 342). Public access centres offer information and computer-related services such as learning systems and support systems for socio-economic growth and sustainability (Chigona et al., 2011: 2). Computer-related services include access to the Internet, government information, e-mails, e-learning and often faxing and copying as well (James, 2006: 342).

The benefits expected from public access to ICTs thus include "the potential to enhanced quality of life" (Chigona et al., 2011: 2). Internet access has been shown to empower people in their feelings of security, personal freedom, and general happiness and personal well-being (Castells, Gelernter, Vázquez & Morozov, 2014: 14); specifically people in the lower income groups, the less qualified, women, and people in developing countries. Castells' study also found that the Internet contributed to feelings of autonomy. Key findings, (see Figure 4), emerging from the Global Impact Study (Clark, Sey & Sullivan, 2012), provide compelling evidence in respect of the on-going need for public access centres.

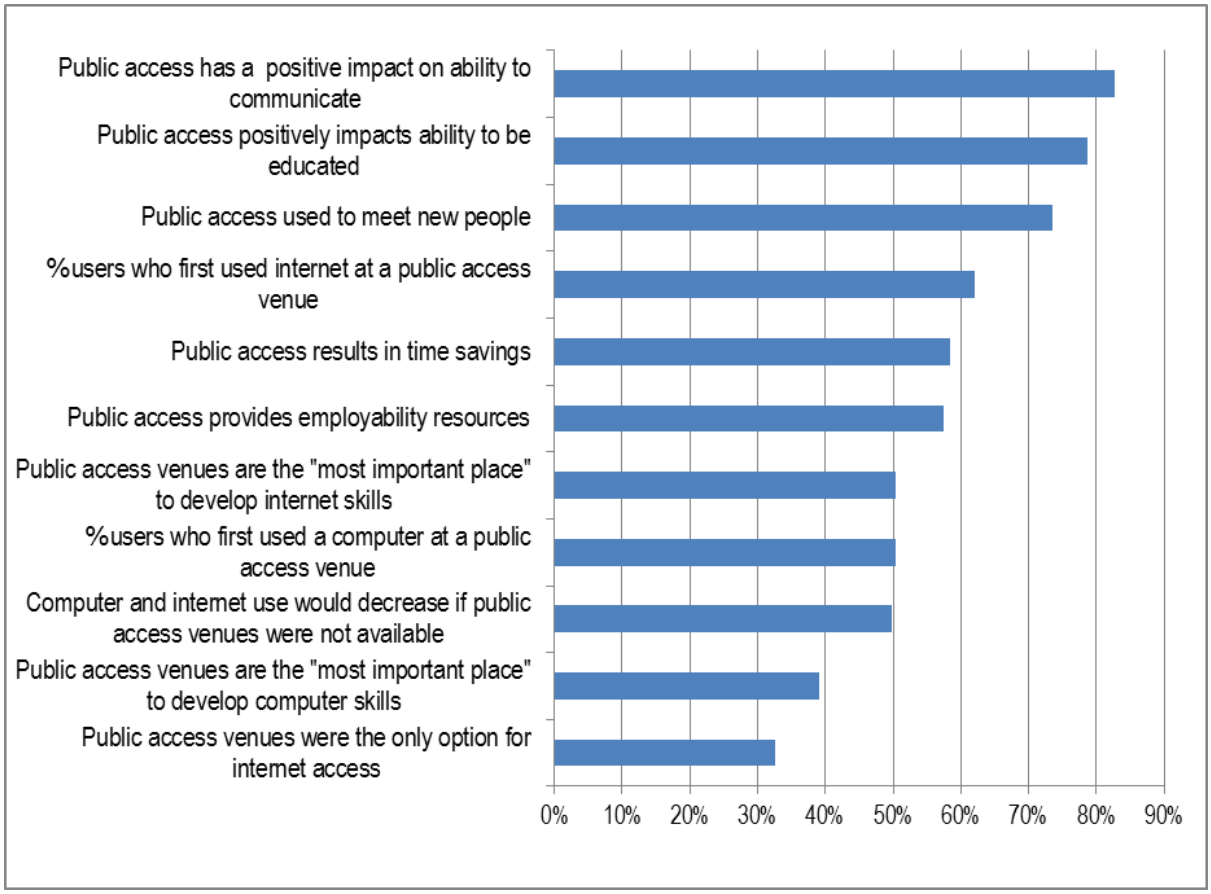


Figure 4: Benefits of Public Access Centres (Raw Data obtained from Clark, Sey & Sullivan, (2012)

## Criticism of public access centres

A number of constraints hampered the functioning of telecentres in some areas. These include financial viability, isolated locations, infrastructure and connectivity costs, and proper servicing of equipment (Samii, 2009: 44). Doubts have also been cast on the validation of real benefits from public access centres, pointing out that benefits are vague, and complex to determine (Chigona et al., 2011: 2). Chigona et al. listed some of the challenges as:

- Provision of technology alone does not translate into usage by the poor (Roman & Colle, 2002)
- Computer literacy
- Anxiety towards computers
- Distance form homes (Oestmann & Dymond, 2001)
- Language barriers of non-English speakers
- Telecentre's fit to the community (Roman & Colle, 2002)

A way to address these problems emerged with the growth of mobile phones into smart phones that can connect to the Internet. By 2009, ITU estimated that 3.3 billion people were phone subscribers worldwide. Samii (2009: 44) stated that mobile phones are more viable

than "previous initiatives like telecentres". Full use of the Internet on a mobile handset, however, is hampered by a number of challenges:

- Connectivity settings
- Security settings
- Menu confusions
- Unfamiliarity with certain terms – such as "password"
- No mobile version of some websites (Gitau, Marsden &Donner, 2010)
- Difficulty in signing up for email accounts from a mobile handset.

Chigona et al. (2011: 11) concluded that even in the face of challenges of public access centres there is evidence of benefits to users of these centres and great demand for such facilities. Even mobile internet users were also still accessing the Internet at the public access centres. This is supported by Walton and Donner (2012: 57) in their conclusion that free use at public access centres supports resource-intensive functions, while mobile supports time-sensitive functions.

## Smart Cape: A Case of a South Africa PAC program

In South Africa the uptake of the Internet is still at unacceptably low levels with 35.2 percent of households having access to the Internet in 2011 (South Africa., 2012c) increasing to 40.9 percent in 2013 (South Africa, 2014). In the Western Cape (which is the geographical domain of this study), 43.7 percent of households had access to Internet in 2011, increasing to 54.4 percent in 2013 (South Africa, 2014).

There is only one detailed report on the South African internet user. Important findings from this report, referred to as the New Wave Report (De Lanerolle, 2012) are that:

> *"For most of those without access at home or work (about four out of five new users) our data shows that Internet cafés, and (to a lesser extent) schools and colleges, are often important point of access that may address some of these limitations of the mobile Internet and enable users to widen the range of online services that they use online."*

According to a local report conducted by World Wide Worx, Internet usage in South Africa grew 25 percent between 2010 and 2012 (World Wide Worx, 2012). The report indicates that the 6.8 million South Africans using the Internet at the end of 2010 increased to 8.5 million by the end of 2011. Whilst on the surface this appears to be very positive, the reality is that for the average South African who cannot afford current prices of broadband, or the devices to use them, interventions are required to maintain the positive growth trend.

In light of this evidence, the free public access to Internet afforded to underserved communities by the City of Cape Town initiative via the Smart Cape project is of utmost importance. This initiative was launched in July 2002, and offers free Internet access at all public libraries, for 45 minutes at a time (Chigona, Roode, Nazeer & Pinnock, 2009: 1). The Smart Cape project listed their three primary goals as:

- To provide free public access to computers and the Internet;
- To prove that open source software is affordable, appropriate technology for a public service digital divide initiative;
- To increase opportunities for members of disadvantaged communities (Infonomics, 2003, p. 5).

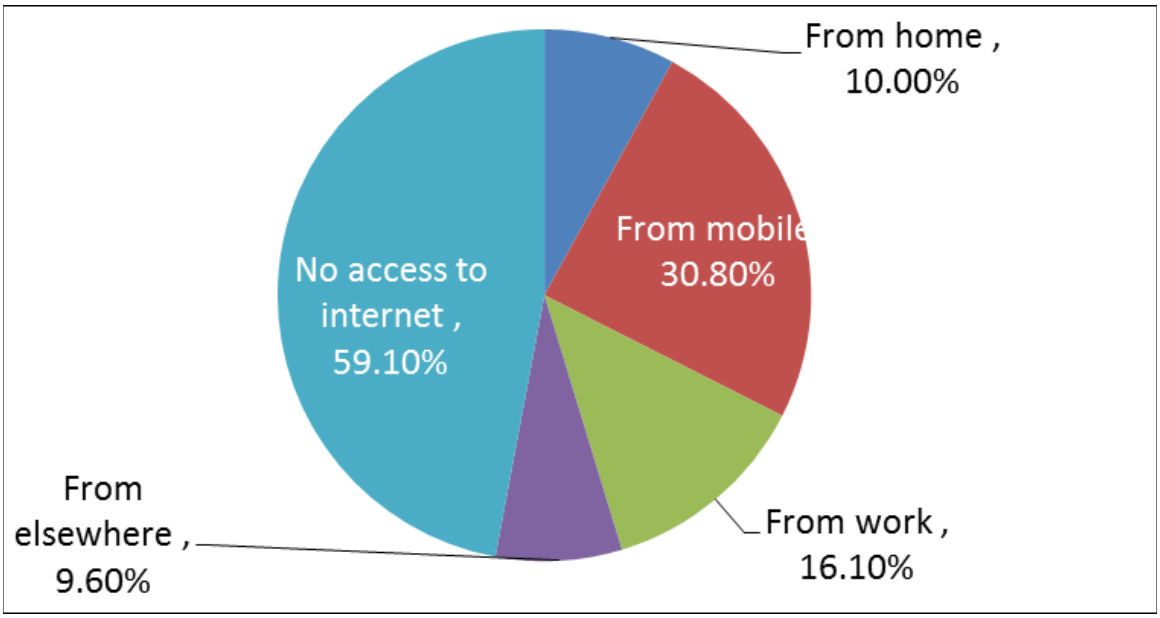


Figure 5: Households access to Internet in 2013 (Data obtained from South Africa (2014, pp. 51-52))

In 2003 the Bill and Melinda Gates Foundation's "Access to Learning" project awarded Smart Cape $1 million to extend the project (South Africa, 2005). By October 2005, the project boasted that the almost five hundred access stations, launched from 2002, have provided computing facilities to more than 26,000 users (ibid.). Currently the City of Cape Town has 103 libraries where community members can access the Internet freely, for up to 45 minutes per day.

Although statistics regarding the number of users, sessions and sessions per user are available from Smart Cape themselves, there is scant evidence at hand to assess current preferences and uses of the public access to ICTs by citizens in the Western Cape.

## Research Design

The overarching objectives of this study were:

- To assess the value proposition of PACs for communities in impoverished areas of South Africa and whether this is still relevant as a policy position to tackle the South African digital divide;
- To understand the profile of users, and the factors which impact on their choice of a PAC as an internet access point;
- The extent to which there is a reliance on PACs;

- To obtain an insight into the benefits of a typical PAC, and in particular and whether PACS provided the average user with something more than just an internet access point.

Given that the Smart Cape is one of the oldest PAC programs in South Africa, and that it continues to function with a degree of sustainability, it provided an ideal case study to attain the aforementioned research objectives. During 2013, after selecting the case, a two-pronged approach was designed. This entailed both focus groups and a survey.

The survey was designed to

- Determine the profile of users, and usage of Smart Cape;
- Determine usage trends of community members accessing the Internet;
- Determine the users' preference in terms of Internet access venue;
- Understand the reliance of users on PACs; and
- Assess the understanding that communities have of the Internet and its benefits (or disadvantages).

However, after the initial survey design, it was decided that rich qualitative data, would complement the survey data. This prompted a mixed research design, where the collection of broad survey data could be used to explain the profile of users and usage patterns and richer qualitative data could be used to acquire a deeper understanding of communities' views and perceptions.

**Focus Groups**

The research study included ten focus groups of purposefully selected community members (15 per group), who lived in close proximity to a public library where Smart Cape computers were installed. During these focus group discussions participants also completed a more detailed survey questionnaire to gather demographic data and ascertain usage patterns.

**Online survey**

A larger online survey was launched, subsequent to the focus group survey, on the Smart Cape website targeting all Smart Cape users of the wider Cape Metropole areas. Smart Cape users, who went online, were requested to complete the survey at the start of their online sessions. If they declined they were redirected to their own user accounts; but if they assented they were first directed to the online website to complete this survey before being redirected to their own user accounts. The online questionnaire was similar to the previous questionnaire; however, due to time constraints on users (each have only 45 minutes once a day to use the computers) the questionnaire contained fewer questions.

**Sampling**

The sample size of users who completed this survey was 2274. The resulting sampling strategy from such a sample is a self-selecting sample and although this is not a random sample, the sample size was large enough to have a precision of 0.021. The population being

investigated were users of the Smart Cape initiative in the Cape Town metropolitan jurisdiction.

The results of a statistical analysis based on these two samples cannot be generalised to the research population when utilising purposive or self-selecting sampling techniques. However, the sample includes a broad mix of respondents from all the Smart Cape libraries in the Cape metro. Very often, as in the case of this study, generalisation of results is not the objective of the research, but rather a description of the current situation.

**Data Analysis**

The data from both surveys were combined before analysis and the responses from the questionnaires were captured and analysed using the statistical software SPSS© version 22. Given that one objective was to identify the factors that influence respondents to use or to prefer to use a public access centre to access the Internet, a multivariate technique called a generalized linear model was implemented to obtain a profile of respondents using and preferring public access centres. Since all the variables are categorical, it was not possible to implement a classic linear regression model. The dependent variables and most of the independent variables were transformed to dichotomous variables i.e. the first dependent variable had the two options: using a PAC or using other means; and the second dependent variable had the two options: prefer to access Internet at a public access centre versus prefer to access Internet elsewhere.

The generalized linear model is of the family of linear models that includes analysis of variance as well as regression models. It is a generalised form of the classic linear model.

Classic linear models assume that all observations are independent of each other and are normally distributed. When working with a construct which was aggregated from Likert-scale type questions in a survey, one cannot safely assume that the construct will be normally distributed. This is the case with the current constructs, with the result that they cannot be modelled by using the classic linear model.

Therefore a generalized linear model for non-normal, categorical or binary data was utilised (Simonoff, 2003; Agresti, 2007). The generalized linear model consists of three components, a random component, a systematic component and a link function (McCullagh & Nelder, 1989).

In the case of the generalized linear model, the first assumption is relaxed such that the dependent values may be from one of the exponential family of distributions[3], the variance does not have to be common, and the link function, mentioned in the third assumption, is monotonic and differentiable. Link functions are chosen according to the data type, and the context of the data. In the case of this study, the dependent variable is a binary variable, thus a logit link function is selected, where p, for example, is the probability (p) of a specific profile preferring a public access centre (Simonoff, 2003: 366-367).

[3] The exponential family is the class of distributions that includes the Normal, Poisson, gamma, inverse Gaussian, binomial, exponential and other distributions.

The logistic regression model relating the predictors (independent variables, i.e. x1, x2 …, xk) to a specific p are written as: (1)

$$\log\frac{p}{1-p} = \alpha + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_k x_k$$

From (1) the probability (p) of a specific user profile, for example, preferring to access Internet at a public access centre can be calculated as (2)

$$p = \frac{e^{\alpha + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_k x_k}}{1 + e^{\alpha + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_k x_k}}$$

The results of the analysis are presented in the following section.

## Findings

### Overview of usage across Smart Cape

The data presented in this section was based on secondary data provided by the Smart Cape program management. Smart Cape records the number of sessions of computer access, as well as the number of distinct registered users for evaluation purposes. Table 1 shows the clear increase of Smart Cape usage from 2008 to 2012. Currently the project has more than 360,000 registered users across the city (City of Cape Town, 2015).

The number of sessions per individual user increased by 26.5 percent from 2012 to 2013, which is an increase of 78.5 percent from 2009 to 2013. The chart in Figure 6 depicts this increase in usage.

Table 1: Number of Smart Cape registered users per financial year

| Financial Years | Registered Users | Total Sessions | Sessions per user |
|---|---|---|---|
| 2008/2009 | 37547 | 718744 | 19.14 |
| 2009/2010 | 33214 | 843607 | 25.40 |
| 2010/2011 | 30821 | 832975 | 27.03 |
| 2011/2012 | 32864 | 887577 | 27.01 |
| 2012/2013 | 11797 | 402952 | 34.16 |

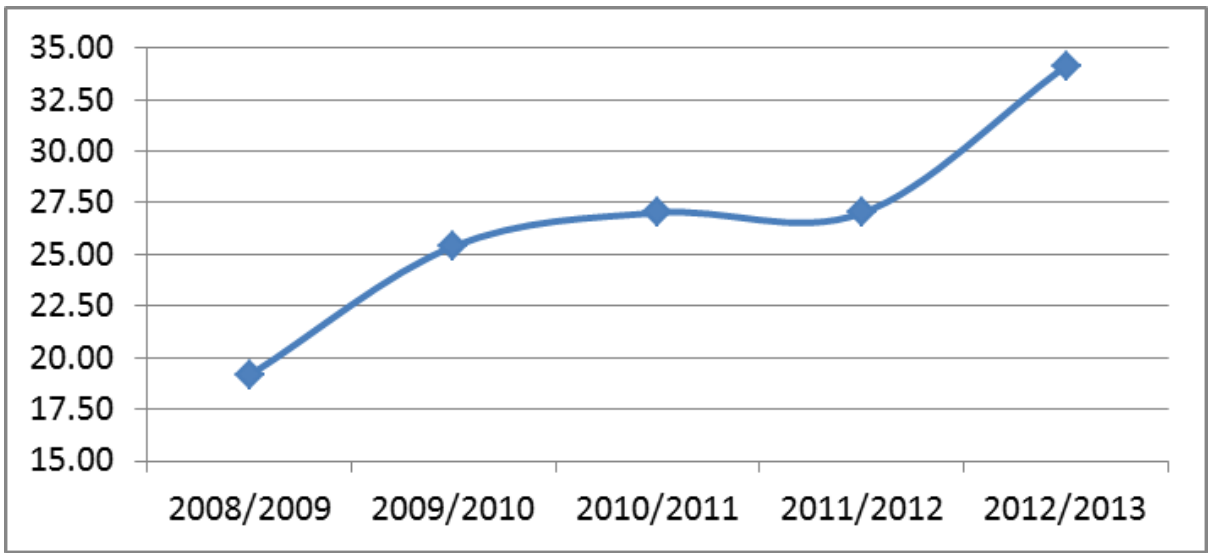


Figure 6: Number of Smart Cape sessions per user in Cape Town libraries

**User profiles, PAC access preferences, and uses of the Internet**

Surveys were completed by 2,400 respondents of which 93.8 percent were from the online survey, and the balance from questionnaires completed during the focus group interview.

Table 2: Distribution of respondents in the two surveys

| | N (%) |
|---|---|
| Focus Group Survey | 150 (6.2% ) |
| Smart Cape Online Survey | 2274 (93.8% ) |
| Total | 2424 (100% ) |

The locations of the libraries where the users completed the survey were from all areas of the Cape Metro, and thus represent a fair spectrum of users.

*General profile of users*

The users were between 15 and 70 years of age, with an average age of 33.1. The male / female gender split was 56.5 percent to 43.5 percent. Almost 39 percent of the respondents indicated that they were unemployed, with the rest equally divided between studying (school/ college or university) and being employed. Two-thirds (67.7 percent) of the respondents indicated their maximum qualification to be grade 12.

*Distance to travel to a PAC*

As to the distance they have to travel to access Internet at the public access centre; 50.7 percent of the respondents reported that they needed to travel between 1 and 2 km to the closest centre and 15.6 percent had to travel between 2 and 5 km. The rest had to travel longer distances.

*Reliance on the PAC as a means to access the Internet*

The distribution of public access versus other ways of accessing Internet is shown in Table 3. Sixty-six percent of the users indicated that they used a public access centre to access the Internet and 80.7 percent *mainly* use public access centres, with 45.6 percent only using public access centres. Forty-three percent of all users indicated that they visited the public access centre daily to access the Internet and a further 33 percent visited it up to three times a week. Thus, the number of respondents accessing the Internet at the public access centre is significantly larger than the number accessing the Internet elsewhere ($\chi 2 = 290.6$, p-value = < 0.001). Eighty-eight percent of the respondents indicated that they own a mobile phone and 70.3 percent indicated that their mobile phone can access the Internet.

Table 3: Places of access to Internet

| I access the Internet… | N (%) |
|---|---|
| From Work | 253 (10.4%) |
| From Home | 379 (15.6%) |
| From a PAC | 1955 (80.7%) |
| From School/College/University | 425 (17.5%) |
| From Mobile/Tablet | 870 (35.9%) |

*Preferred point of access to the Internet*

To answer the research question regarding the respondents' preferred point of access of Internet, the question "Where would you prefer to access the Internet from?" was included in the questionnaires.

The result, represented in Figure 7, shows that a significant number of respondents (53.3 percent) preferred to use the public access centre rather than an internet or home use ($\chi 2 = 13.32$, p-value = < 0.001). The reasons for their preference are given in Figure 8. Between 70 percent and 90 percent of the users found searching for information pertaining to various topics or issues fairly easy (see Figure 9).

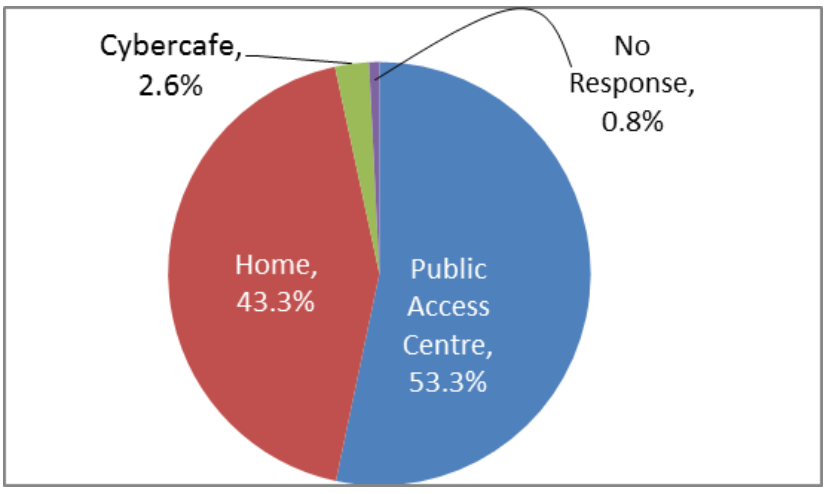


Figure 7: Point of Internet access preference by respondents


Figure 8: Reasons for choosing a PAC as first choice

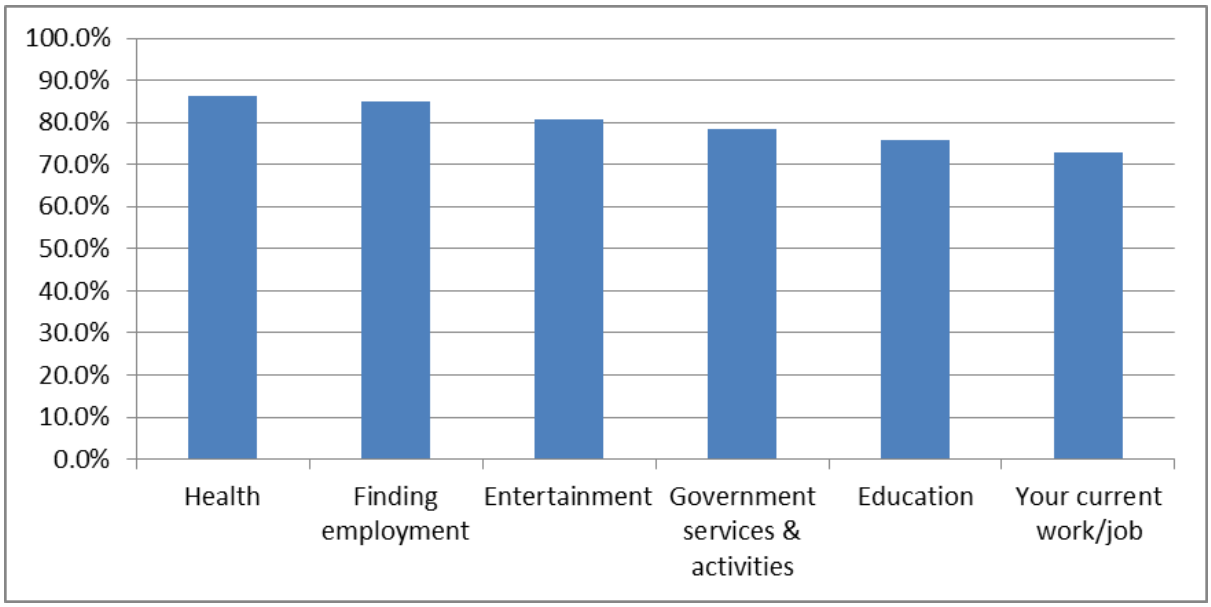


Figure 9: Percentage of users finding topic searches easy

The results above shows that public access centres are still the most preferred point of access to the Internet by these users. The three main reasons given for this were:

- Free to use;
- Can receive assistance from others (as well as give);
- Can receive free training in computer and Internet skills.

*Ease of searching for information*

Almost sixty percent of all users indicated that they found working on a computer and using the Internet easy and 19.6 percent need some help with both. Users often assist one another

when they are accessing Internet at Smart Cape libraries, which is one of the benefits of public access centres listed by the Global Impact Study (Clark, Sey & Sullivan, 2012). In this Smart Cape study 65.9 percent of the users indicated that they have assisted other users and 38 percent indicated that they have received assistance from other users.

Only 1551 users responded to the question "How easy is it to use the Internet to study?" Of these 51.2 percent indicated that they found it very easy and a further 37.1 percent indicated that they sometimes needed assistance.

*Internet access location and device preference*

A recent ITU study found that only 40 percent of households worldwide had Internet access in their homes (ITU, 2014). In the Smart Cape study, users indicated that 24.5 percent had a computer at home and could access Internet from it, whereas 70.3 percent of the users owned mobile phones from which they could access the Internet.

The focus group survey asked the respondents about their preferred device from which to access the Internet. Almost 55 percent indicated that they would prefer to use a desktop while 41.3 percent indicated that they would prefer to use a mobile phone (Figure 10).

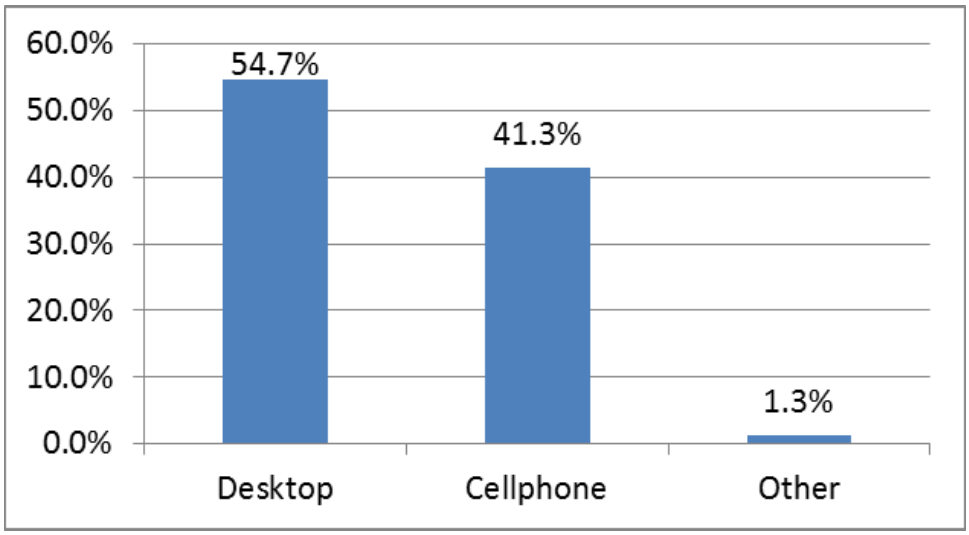


Figure 10: Device preference of Focus Group respondents

*Most important uses of the internet*

The respondents in the focus group survey responded to an open question asking them which usage of the Internet and computers at the centre are the most important for them. Finding information about education, employment and using social media were listed in the top three most important usages (see Figure 11).

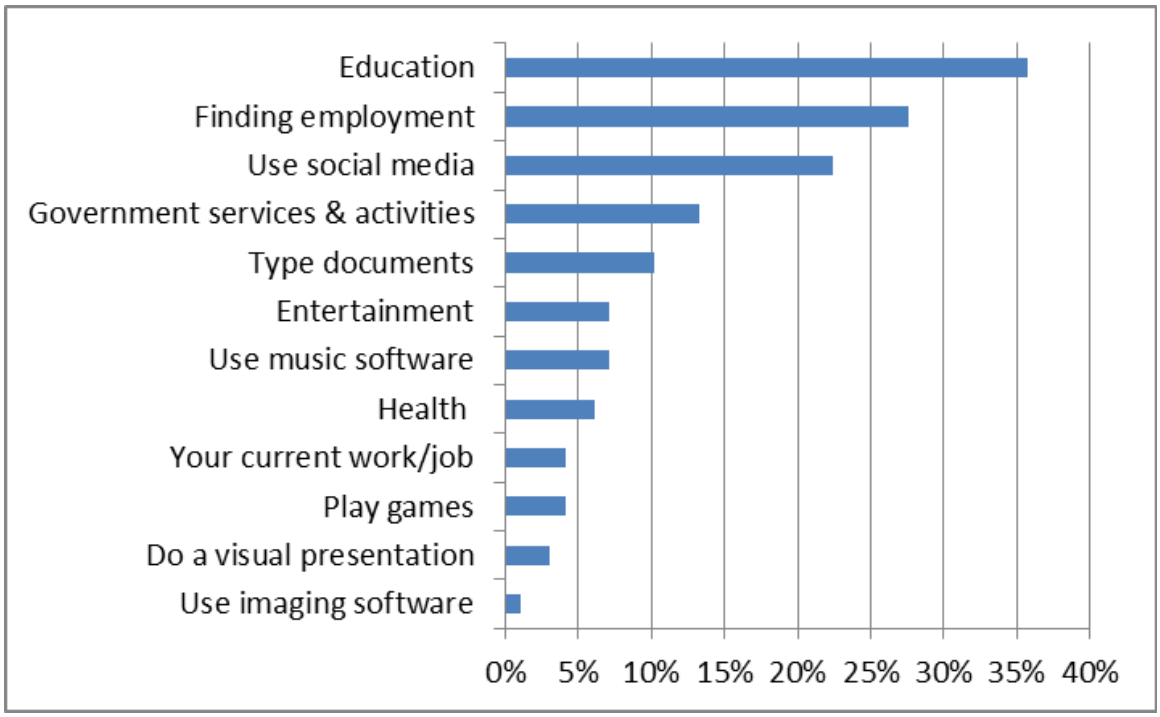


Figure 11: Most important usage of computers/Internet at a public access centre

**Reliance on PACs**

The results given in section User profiles, PAC access preferences, and uses of the Internet show a high level of use of the Smart Cape program even though mobile phone usage has penetrated the South African market to a large extent. This begs the question of which particular factors influence people to use the public access centres, and why they prefer to keep on using the public access centres. In other words, what is the actual user profile of the person using the public access centre, or preferring a public access centre to connect to Internet? To answer these questions a Generalized Linear Model was applied to determine which variables affected the choice to use a public access centre and the preference for using a public access centre.

In this model the factors suspected of influencing the choices to use or to prefer to use are the predictor variables (independent variables), which were chosen from all the other questions in the study.

*Results pertaining to access use and access preference*

The analysis was applied repeatedly until a significant model (having a good fit) emerged. The goodness-of-fit statistics (see Appendix), which indicate that the models have a good fit, are given by the Likelihood Ratio Chi-Square values of 116.064 and 217.167 respectively, (p–value for both $< 0.001$; $n = 2279$).

According to the results (see Appendix) the variables having a significant effect on the choice of venue for internet access are represented by the following factors with a significant effect on PAC as a choice of venue to access the Internet:

- Employment group(three categories)
- Grade group (Highest School Education; 4 categories)
- Distance to PAC (1 – 2 km vs 0, or further).

The variables having a significant effect on the preference or use of a public access centre are represented by the following Factors With A Significant Effect On Preference To Use A PAC:

- Grade group (Highest School Education; 4 categories)
- Finding Information (easy or not)
- Computer at home with internet (yes/no)
- Language (4 categories)
- Distance to PAC (1 – 2 km vs 0, or further)
- Ease of reading/writing in English (3 categories)

**Profile of a user most inclined to use a PAC**

Using the parameter estimates of the relevant factors from the generalized linear model (see Appendix) and equation 2, the probability that a specific profile of a user will access the Internet at a PAC can be calculated. The higher the probability, the more likely it is that this is the profile of a typical user.

An unemployed person, having completed grade 7, and having to travel at least 2km to the PAC has a probability of 0.95 of using a public access centre to access the Internet. The probability of accessing the Internet at a public access centre decreases to 0.83 in the case of another person having all the same characteristics except for being employed. The probability of unemployed people accessing the Internet at a PAC ranges from 0.60 to 0.95, depending on their education level, and how far they need to travel to access the PAC.

The probability of a person preferring to access the Internet at a PAC can be calculated in a similar manner, using the parameter estimates of the generalized linear model, having PAC preference as the dependent variable.

Thus a Xhosa-speaking person[4] having completed grade 7, being proficient in searching on the Internet, not having to travel too far (1 – 2 km) to the PAC, having a computer at home and being somewhat proficient in reading and writing English has a probability of 0.989 of preferring to access the Internet at a PAC. A person that has all the same characteristics but has completed grade 12 has a 0.78 probability of preferring a PAC for Internet access.

A person's employment status thus plays a significant role in the choice to access the Internet at a PAC. However it does not influence the preference for using a PAC. The factor that has the greatest influence on the preference of access is the proficiency in reading or writing the English language. These findings are significant in the light of the fact that the rate of unemployment in the Western Cape is at 21.4 percent in 2011 (South Africa., 2012a, p. 17; 2012c, p. 46) and 30.3 percent of the population of the Western Cape indicated Grade 12 as

[4] Xhosa is one of eleven official South African languages.

their highest level of education (South Africa., 2012a: 15). In this study 39 percent of the respondents indicated that they are unemployed and only 67 percent of the respondents older than 20 have completed grade 12.

The foregoing findings suggest that the profile of users most likely to visit a PAC to access the Internet comprises a combination of factors[5] (Figure 11).

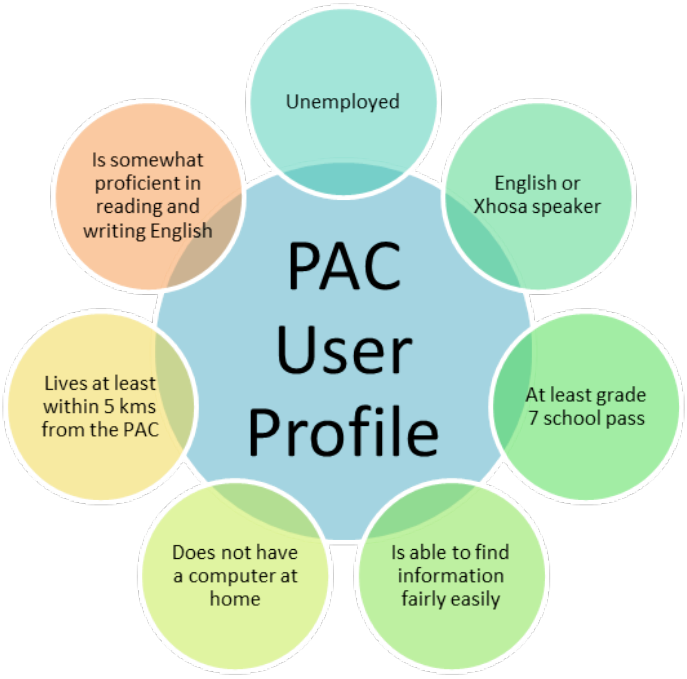


Figure 11: Typical profile of users who are most likely to visit a PAC to access the internet

**Hope for the future: The importance of PACs in marginalised communities**

Accessing the Internet freely at PACs offers new ways of finding information. However, a question which was investigated was whether there is any intrinsic impact on citizens' outlook to life in general. The questionnaire thus included a question on the hopefulness of the respondents for their future.

A positive correlation has been shown by Castells et al. (2014: 138-139) between the frequency and intensity of the use of the Internet and the indicators of personal happiness. Feelings of empowerment and influence increased with increased use of the Internet. In keeping with this, the question for this research was whether a relationship between aspirations of hope and the use of the Internet at a PAC exists.

In this research four questions relating to the respondents hopefulness towards their own future, and then that of their family, their community, and their country were included in both questionnaires. The results (Table 4) show that more than 70 percent of the respondents have

[5] The combined facts are based on our analysis of both "use" and "preference to use" a PAC.

a very definite attitude of hope for themselves and their families. Slightly fewer (but still more than 50 percent) have hope for the communities and the country.

Table 4: Hopefulness in sample

| | Responses | % Cases |
|---|---|---|
| I am very hopeful for the future for myself | 1826 | 75.3% |
| I am very hopeful for the future of my family | 1798 | 74.2% |
| I am very hopeful for the future of my community | 1296 | 53.5% |
| I am very hopeful for the future of South Africa | 1307 | 53.9% |

Combining the outcomes of all four questions, 1776 (73.5 percent of the 2417 that responded) of the respondents were hopeful in all instances, whereas 26.5 percent were not hopeful in at least one of the four situations. To determine whether the frequency and intensity of use of the Internet has a significant influence on the hopefulness of the respondents the same multivariate technique, the generalized linear model, was applied. The following predictor variables had a significant effect on the dependent variable, hopefulness, in all instances.

- Age group (five categories)
- Employment group (three categories)
- Keyboard proficiency (three categories)
- Finding information easily (two categories)
- Preferring to use a PAC (three categories)
- Language (four categories)

The overall model is significant ($\chi 2 = 87.951$, p-value $< 0.001$) (See Appendix for the tests for model effects and parameters).

Thus, using equation 2 and the parameters estimates, the probability of a person in this research study being hopeful in all instances (self, family, community and country) is 0.92 if it is an unemployed Xhosa-speaking person between the ages of 25 and 34, being proficient in using a keyboard and finding information easily on the Internet, preferring using a public access centre. If this person has some difficulty in using a computer keyboard and in finding information this probability of being hopeful drops to 0.79.

This shows that preferring to use a PAC, using the PAC to access the Internet often enough to hone keyboard skills, and finding information easily from the Internet has a significant influence on hopefulness for respondents in this study.

The foregoing thus provides a very compelling argument for the role of PACs in respect of a critical intangible benefit. In the first instance it is noted that PACs provide the enabling infrastructure for citizens to find information, to be able to use a computer keyboard, and as a venue which is preferred over other options such as at home or via a mobile device. The

results of the analysis indicate that all of the latter have a significant effect on the hopefulness a citizen has for his or her self, community and country.

## Conclusion

This study has showed that PACs in impoverished areas continue to play a relevant and significant role in bringing ICTs to the communities. Eighty-one percent of respondents in this study *mainly* use public access centres, with 45.6 percent *only* using public access centres and 53.3 percent preferring to access the Internet at a PAC. Forty-three percent of all users indicated that they visited the public access centre daily to access the Internet and a further 33 percent visited it up to three times a week. Thus the number of respondents accessing the Internet at the public access centre is significantly larger than the number accessing the Internet elsewhere, even though 70.3 percent of the respondents have mobile phones that can access the Internet. This confirms the findings of a study of low and medium income countries by Sey, Bar, Coward, Koepke, Rothschild & Sciadas (2015). A respondent's choice to access the Internet at a PAC is significantly influenced by his/her employment status. The typical profile of a PAC user is an unemployed person having completed at least grade 7, living within a 5km radius of the PAC. On the other hand a person's preference for accessing the Internet at a PAC is significantly influenced by his/her level of school education.

The study also provides evidence that a significant number of community members use the Smart Cape venues to access the Internet and a significant number still prefer to access the Internet at a public access venue. The role for public access to the Internet at community level is therefore a critical one. For certain income groups public access will be a stepping stone until affordable access to the Internet at home is a reality. Moreover the results of the survey substantiate that there still is a demand for free Internet services. We can conclude therefore that Public Access Centres remain an essential part of ensuring that all communities are able to benefit from increased broadband penetration. There will always be citizens whose circumstances make it difficult to own a device that gives them access to government, social media, and the wealth of information and services that exist on the Web.

Finally, the importance of PACs in marginalised communities really comes to light when more than just the tangible is investigated. Our study found that more users of PACs have a very definite hope for themselves and their families. Slightly fewer, but still a majority, have hope for their communities and the country. The probability of a user being hopeful in *all* circumstances is dependent on his/her ability to find information and to use a computer keyboard with ease.

As is posited by Gomez and Pather (2010, p. 11) a shift in focus from the measurable to the non-measurable is more relevant in determining the value PACs bring to the economically marginalised communities. Hope is an intangible benefit, but this is probably a far more important benefit to PAC users than the tangible benefits which are commonly identified in the literature. We suggest that that the instilling of hope is important to individuals who are stuck in a poverty rut. Further it is an important precursor to social and economic development. If PACs are able to provide individual citizens hope for the future, then certainly government policy which supports a PAC program must be entrenched. Further studies in this regard are to be encouraged. The notion of hope which is derived from having

access to the internet is an interesting notion which deserves a more detailed inquiry. Such an inquiry will shed more insights into the questions asked in studies (e.g., Gomez & Pather, 2010) as to whether we are evaluating the right benefits when examining ICT programmatic interventions.

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# Appendix

Table 1: Hypothesis results

| Omnibus test | Access use | Access Preference |
|---|---|---|
| $\chi^2$-value<br>p-value | 73.441<br>< 0.001 | 217.167<br>< 0.001 |
| $H_0$: Model no different from intercept only model | Reject $H_0$ | Reject $H_0$ |

Table 2: Tests of Model effects

| | Access Use | | | Access Preference | | |
|---|---|---|---|---|---|---|
| | Type III | | | Type III | | |
| Source | Wald Chi-Square | df | p-value | Wald Chi-Square | df | p-value |
| (Intercept) | 145.055 | 1 | .000 | | | |
| Employment group | 22.089 | 2 | .000 | | | |
| Grade category | 11.563 | 4 | .021 | 19.128 | 4 | 0.001 |
| Finding Information | | | | 5.665 | 1 | 0.017 |
| Having a computer at home | | | | 27.378 | 1 | 0.001 |
| Language | | | | 14.634 | 3 | 0.002 |
| Distance to PAC | 31.020 | 3 | .000 | 14.580 | 3 | 0.002 |
| Proficiency in reading, writing English | | | | 12.227 | | 0.002 |

Table 3: Parameter estimates (B) of the significant predictor variables

| Parameter | x-value | Access use | Access Preference |
|---|---|---|---|
| Intercept | | 2.255 | |
| Employment = At School/College | 1 | -0.503 | |
| Employment = Employed | 2 | -0.678 | |
| School grade passed = Grade 1 – Grade 4 | 1 | -1.126 | -0.041 |
| School grade passed = Grade 5 – Grade 7 | 2 | .0.147 | 0.415 |
| School grade passed = Grade 8 – Grade 9 | 3 | -0.322 | 0.145 |
| School grade passed = Grade 10 – Grade 11 | 4 | -0.120 | -0.156 |
| School grade passed = Grade 12 | 5 | 0.0 | -0.405 |
| Finding Information easily = no | 2 | | -0.215 |

| | | | |
|---|---|---|---|
| Having a computer at home = no | 2 | | 0.470 |
| Language = Afrikaans | 1 | | 0.074 |
| Language = English | 2 | | 0.260 |
| Language = Xhosa | 3 | | 0.616 |
| Distance from PAC = 0km (at home) | 1 | -0.742 | -0.091 |
| Distance from PAC = 1 – 2km | 2 | -0.027 | 0.341 |
| Distance from PAC = 2 – 5km | 3 | 0.141 | 0.063 |
| Read/write English =- difficult | 3 | | -1.184 |
| Read/write English = somewhat easy | 2 | | 0.392 |

The probability of a respondent using the public access centre when this person is unemployed, having passed grade 7 and living within 5 km from the centre is:

$$p = \frac{e^{2.255+(2)(0.147)+(3)(0.141)}}{1+e^{2.255+(2)(0.147)+(3)(0.141)}} = \frac{19.53}{1+19.53} = 0.951$$

The probability of a Xhosa-speaking person[6] preferring to access the Internet at a PAC having completed grade 7, being proficient in searching on the Internet, not having to travel too far (1 – 2 km) to the PAC, having a computer at home and being somewhat proficient in reading and writing English is:

$$p = \frac{e^{(2)(0.298)+(2)(0.365)+(2)(0.470)+(3)(0.478)+(2)*(0.392)}}{1+e^{(2)(0.415)+(2)(0.341)+(3)\,0.616}} = \frac{4.4816}{1+4.4816} = 0.989$$

Table 4: Test for model effects of the combined "hope" dependent variable

| Source | Type III | | |
|---|---|---|---|
| | Wald Chi-Square | df | Sig. |
| (Intercept) | 7.700 | 1 | .006 |
| Age group | 13.745 | 5 | .017 |
| Employment group | 16.779 | 2 | .000 |
| Keyboard Proficiency | 14.417 | 3 | .002 |
| Finding Information Easily | 9.429 | 1 | .002 |
| Preferring to use PAC | 8.811 | 2 | .012 |
| Language | 37.925 | 3 | .000 |

The probability of a person in this research study being hopeful in all instances (self, family, community and country) is 0.92 if it is an unemployed Xhosa-speaking person between the

[6] Xhosa is one of eleven official South African languages

ages of 25 and 34, being proficient in using a keyboard and finding information easily on the Internet, preferring using a public access centre.

Table 5: Parameter estimates (B) of the significant predictor variables for dependent variable “Hope”

| Parameter | B |
|---|---|
| (Intercept) | -1.117 |
| Under 18 | .155 |
| 18-24 | .110 |
| 25-34 | .339 |
| 35-44 | .079 |
| 45 to 64 | -.170 |
| Employment = At School/College | .031 |
| Employment = Employed | .419 |
| Keyboard proficiency =Easy | .408 |
| Keyboard proficiency =Some difficulty | -.029 |
| Keyboard proficiency =Difficult | -.127 |
| Finding information easily = Yes | 0.277 |
| POA preference = PAC | .177 |
| POA preference = Internet cafe | -.537 |
| Language = Afrikaans | -.142 |
| Language = English | -.059 |
| Language = Xhosa | .541 |