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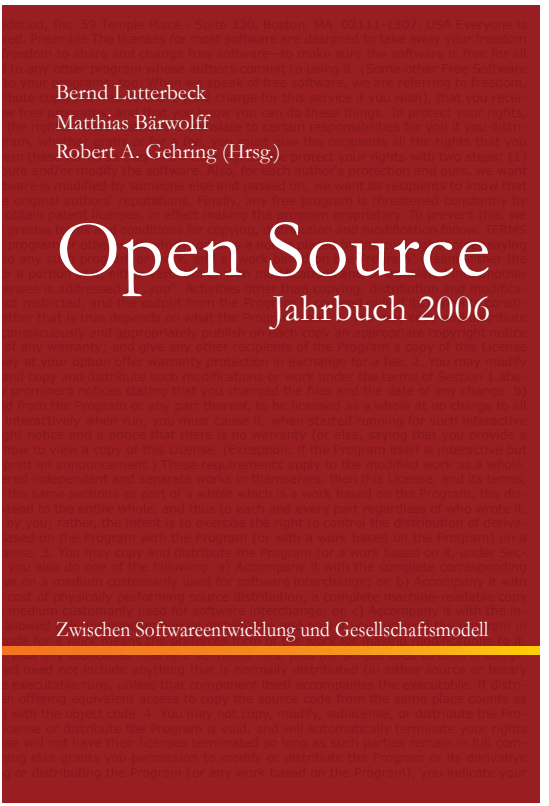

available at www.opensourcejahrbuch.de.

The *Open Source Jahrbuch 2006* is an extensive compendium dealing with the various aspects of open source software and beyond. Whilst most articles have been written in German, this is one of the articles that have originally been written in English and subsequently been translated into German. Refer to our website for more English articles as well as our translation wiki.

Digital opportunity in Africa

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Approximately fourteen percent of the world's population lives in Africa and yet the continent's users account for just 2.5 percent of the Internet's users. This is despite an estimated 428 percent increase in Internet usage on the continent between 2000 and 2005. In comparison, a region such as Oceania/Australia with a population accounting for just 0.5 percent of the world's total residents, makes up 1.8 percent of the world's Internet users. Arresting these disparities is no easy task. In many countries of Africa telecommunications infrastructure and access is so limited and regulated as to make it all but impossible for businesses to operate. In others, the gradual move to liberalisation has brought with it new challenges. On the ground, however, there are many organisations making a real difference to citizen's lives and open source technologies are leading the way.

Keywords: Digital Divide · Africa · South Africa

1 Introduction

Quantifying the so-called 'Digital Divide' in Africa is no easy task. In part this is, ironically, because the lack of infrastructure, the size of Africa and its dispersed population makes this a uniquely challenging activity. Unlike continental users in Europe or the US, where significant access to telecommunications and the Internet makes data collection significantly easier, in Africa the reports of connectivity are gathered from a series of sources of varying quality. All reports suggest that Africa is indeed increasing its access to IT and telecommunications at a significant rate. Most reports also highlight the fact that the increases are off a very low base, and even at this accelerated rate the numbers of Internet and telecommunications users are woefully low.

Region/Country	Population in millions	Internet users in millions	Population with Internet access
Africa	896.0	23.8	2.7 %
Germany	82.7	47.0	57.0 %
United Kingdom	59.8	36.0	60.2 %
Australia/Oceania	33.0	17.0	52.8 %

Table 1: Number of Internet users in selected regions (Miniwatts Marketing Group 2005)

There are many metrics applied to connectivity around the world. Some are better than others but in all of them continental Africa is noticeably disadvantaged with regards information technology and access to the Internet and telecommunications.

To put Africa into its context it is useful to draw some comparisons between the continent's access to technology and that experienced by other nations:

Estimates of the number of Internet users resident in Africa currently range between 19 million (International Telecommunication Union 2004) and 23.8 million (Miniwatts Marketing Group 2005). To put this in context these numbers represent between 2.1 and 2.7 percent of the total population of the continent which has access to the Internet. In terms of overall Internet access this means that African users account for approximately 2.5 percent of the world's Internet users.

To put this further into context, a country such as Germany, with a population a 10th the size of the African population has approximately 47 million Internet users, in comparison with Africa's 23.8 million.[1] Similarly, a United Kingdom population of around 60 million has more than 36 million Internet users (table 1).

It is not, however, only in the Internet space that Africa fares badly. The disadvantages Africa faces are going well beyond the Internet space and includes very low access to telephones, high bandwidth costs and restrictive telecommunications regimes.

In 2004, less than three out of every 100 Africans had access to the Internet, compared with an average of one out of every two inhabitants of the G8 countries[2] (World Summit on the Information Society 2005). Similarly the ITU says the G8 countries are home to just 15 % of the world's population but almost 50 % of the world's total Internet users.

Teledensity in African countries is also exceedingly low. On average there are approximately three fixed telephone lines per 100 people. In comparison the Americas region (North and South America) has an average of 34 fixed lines per 100 citizens and the European region as much as 40 fixed lines per 100 people (World Summit on the Information Society 2005). Additionally, of Africa's 26 million fixed lines

1 The *International Telecommunications Union* states Germany's Internet usage at 41.2 million in 2004.

2 Canada, France, Germany, Italy, Japan, Russia, the UK and the US

Region/Country	Population in millions	Internet	Mobile phone	Fixed line
Europe	807.3	35.7 %	70.0 %	40.0 %
Africa	896.0	2.7 %	7.6 %	3.5 %
South Africa	46.9	10.1 %	41.0 %	9.9 %

Table 2: Comparison of communication access in selected regions

more than 75 % are found in just six African countries. Interestingly the numbers for mobile telephone users are significantly higher although still significantly behind the world average. There are an estimated 7.6 mobile phone subscribers per 100 citizens in Africa while in Europe the mobile subscriber base is as high as 70 percent. In South Africa there are almost as many mobile subscribers as there are in the rest of the continent in total (41 out of every 100 citizens has a mobile phone, International Telecommunication Union 2004). South Africa to a large degree dominates the African IT markets with significantly higher rates of Internet access (20 % of African Internet users are in South Africa), more mobile subscribers than any other African country (41 out of 100 citizens has a mobile phone, compared with the continental average of 7.6), and there are 9.9 main telephone lines per 100 citizens (the continental average is 3.5). See also table 2.

For all its development, however, South Africa stands as a good example of how, despite significant progress over the past decade, it is still frustrated by high-bandwidth costs, low access rates and a regulatory environment that restricts rather than promotes access and development.

From here I will look at South Africa as an example of one country that has much of the required skills and infrastructure to overcome these African challenges and yet still has many hurdles to overcome. Many of these challenges are typical of the African context, even if the magnitude differs from country to country.

2 Direct challenges

South Africa is one of just a handful of countries with a well-developed Internet sector in the sense of an accessible and competitive ISP market. Dial-up, ISDN, DSL and Wireless connectivity options are widely available to consumers at a range of prices. On the surface the market looks to have the elements of a developed infrastructure and mature market. In truth, however the market still labours under a regulatory regime that is dominated by just one telecommunications provider, *Telkom*.

While there have been ongoing negotiations and preparations for a second national operator for the past two years, the process has been continually thwarted by a telecommunications company that is putting obstacles in the way of its implementa-

Country	Capped	Speed	Cost approx.
South Afrika	30 GB	1 Mbps	498.80 €
United Kingdom	40 GB	2 Mbps	44.30 €

Table 3: Cost for ADSL access

tion. As it stands at present the second national operator licence has been signed but its roll-out has yet to begin.

In the interim consumers are increasingly objecting to the comparatively high prices they are expected to pay for Internet and telecommunications services and many are opting for the recently-introduced range of wireless services on offer, even though many of these are not significantly cheaper than fixed line ADSL services.

A recent comparison of South African ADSL prices against those of more developed nations sugested that a 1 Mbps shaped (30 GB) service from *Telkom* cost as much as 1 000 times more than similar services in the UK. Against pricing for services in countries such as Japan the pricing differential was even more stark (Monteiro 2005). See also table 3.

More importantly, however, *Telkom* introduced a new policy in November 2005 that introduced a 'hard cap' in terms of which users that exceed their monthly bandwidth allocation are completely disconnected from the Internet. Previously users that reached their limit each month were directed to a throttled local service that would allow them to check local email and websites. International destinations were however cut off to them. With the new regime in place (from 1 November 2005) users will be unable to access local or international sites after their limit has been reached.

The consequences of this is potentially disastrous for local businesses that rely on Internet access to pursue their businesses, particularly in the small and medium business sector which is a large user of ADSL services. It also has the potential to increase their monthly access charges if users are forced to purchase additional costly bandwidth at the end of the month.

Sadly, while South African's are in a position to complain about the relatively high costs of access in their country, many other African consumers do not even have a service to complain of.

3 Access to technology

A bigger problem facing the continent, however, is the very low penetration rate of PCs in most countries. The continental average for PC ownership is a very low 1.7 PCs per 100 inhabitants (in 2004).[3] Countries such as South Africa (8.2 PCs per 100), Zimbabwe (7.7) and Morocco (27) are the best serviced in this area. However,

3 *International Telecommunications Union*, Technology Indicators 2004, http://www.itu.int

in comparison with the estimated 29.3 PCs per 100 citizens of Europe and the 74 PCs per 100 US citizens the numbers are disturbingly low.

With this level of PC access the continent faces significant challenges in overcoming the PC illiterate status of the region. Interestingly the relatively low penetration of PCs in the region has spawned a growing industry in the refurbishment and resale of second hand PCs. Typically these PCs are sourced from either local enterprises as they write off their equipment and replace it with new hardware or through international aid and donor agencies. Increasingly these PCs are being sourced from companies based in Europe or in the US where the age of PCs being written off is significantly lower than in many African countries.

The influx of second-hand PCs has both a beneficial and a potentially disastrous consequence. On the positive side the additional refurbished PCs are proving to be of huge benefit to—in particular—schools on the continent that are able to gain, even limited, access to some form of PCs which facilitate the education process. There are a number of organisations working very actively in this sector and proving to be doing an excellent job.

One of these is *OpenLab International*, based in South Africa but active across the continent. The organisation—a commercial company—works primarily in the educational sector of the countries it is active in and supplies schools with thin-client Linux PCs using its self-developed Linux operating system called *OpenLab*. The organisation has rolled out more than 500 Linux-based computer laboratories across the continent in the past two years.

OpenLab works very closely with educational organisations like *SchoolNet Namibia*, an educational non-profit organisation active in Namibia. *SchoolNet Namibia* is part of the greater *SchoolNet* network active across the African continent in giving learners access to the Internet and computers for education. *SchoolNet Namibia* uses primarily refurbised PCs which it imports—from Europe and the UK primarily—in bulk and which are repaired and prepared for installation locally. Most of these PCs are installed and run in a thin-client setup.

Thin clients are typically second-hand PCs that have been refurbished and have had their hard disks removed. The machines use a modified network card to boot off a central server. All data for the individual terminals are stored centrally on a server. Because the actual client machine has no hard disk data can not be stored locally.

While not necessarily the optimum solution to providing quality access to PCs for school learners—the machines are older and consequently slower with lower specifications—the thin client refurbished PC approach does have the benefit of being an elegant solution to tight budgetary constraints and limited resources. Thin clients also have the added benefit of being low-maintenance—a benefit in environments where skills are in significant shortage—and can be mostly maintained through simply administering a central server. Thin clients also perform comparatively well in environments not well suited to PC operations such as those in Namibia or central

Africa where desert-like conditions, including sand and high temperatures, take their toll on PC hardware.

On the negative side, however, refurbished PCs raise a number of issues that need to be addressed. These include the long-term disposal costs of the hundreds of thousands—perhaps even millions—of second hand PCs arriving on the continent. With an already limited lifespan the PCs pose an ecological challenge that will need to be addressed very soon.

Equally importantly, the use of second hand technology to educate the school learners of the continent is a source of contention among many observers, some of which argue that the use of inferior quality IT equipment to educate students serves more to reinforce the 'digital divide' than overcome it. The counter argument to this is that access for as many as possible to technology—even inferior technology—is better than limited and exclusive access to IT for just a few preferred and well-funded schools.

Providing access to any form of technology in Africa, however, is beset by problems that often appear to be insurmountable. Take for example the case of *Schoolnet Namibia*, an organisation that equips schools with computers and computer-based learning materials. They typically do this using refurbished PCs and a Linux thin-client solution. Even despite their innovative approach to providing computer access to schools—and the success they have achieved they face seemingly insurmountable odds. A recent snapshot of the country's schools looks as follows:

There are approximately 1 565 schools in the country. Of these just 200 have access to the Internet and 35 % of these are considered to be on the danger list as they lack reliable electricity or other infrastructure like telecommunications. There are approximately 900 schools without electricity and/or telecommunications facilities. Almost 300 of these are secondary schools. As of 2004 it was estimated there there was one computer for every 280 learners and eight teachers in the country. The net effect of this is that the opportunity for computer access for each learner is approximately six minutes a week.[4]

Not only do organisations wanting to grow ICT access in the country have to overcome the cost barriers of providing new—or even refurbished—PCs to schools but in many cases they must add to that the infrastructure costs providing electricity, telecommunications or alternative access methodologies such as wireless and satellite.

Namibia, however, is one of the more fortunate countries in Africa with a PC penetration rate of approximately eleven PCs per 100 citizens (2004).[5] The continental average is estimated at 1.7 PCs per 100 citizens. Namibia also benefits from a range of strong and active organisations that are promoting technology access in the country as well as a close relationship between these organisations and the government of the country. Other countries are far less fortunate.

4 Joris Komen, *Schoolnet Namibia*, January 2004

5 *International Telecommunications Union*, 2004 ICT indicators, http://www.itu.int

4 Language complexity

The language of the Internet is English. This despite the fact that English is by no means the dominant language of the world. The language of the technology world is similarly biased towards the English language.

However, in countries with a strong market for software and a proving buying power, software vendors have seen financial benefit in translating their software into local languages such as German, French and Spanish.

Unfortunately for Africa, its multiplicity of languages and its significantly weaker buying power has ensured that local languages are largely ignored. While a product such as Microsoft Windows is available in at least 40 languages it is only recently that the software has been made available by the company in an important African language such as Kiswahili, a language that is spoken by approximately 5 million first language speakers (African Studies Center 2005) and as many as 40 million second language speakers. Despite the relative number of speakers the low-access rates and PC usage largely marginalised the language for proprietary vendors.

In late 2004, however, Microsoft announced plans to localise its software for the language, a process that culminated in an announcement in late 2005. Interestingly, the growing number of Kiswahili computer users had already become frustrated by the lack of support for their language and in March of 2004 had already produced a Kiswahili spell checker for the open source software *OpenOffice.org* suite (Otter 2004).

Similarly Microsoft announced plans in late 2003 to translate its core productivity tools into a range of South African languages including Zulu and Xhosa. Again this followed the efforts of the South Africa *Translate.org.za* project which started to translate open source software into indigenous South African languages in 2001. In November 2005 the project released the *OpenOffice.org* office suite in all eleven official South African languages.

Translate.org.za is a non-profit organisation that has as its objective the translation of free and open source software into the eleven official languages of South Africa. Originally started in 2001 by Dwayne Bailey, *Translate.org.za* is funded by donors including the South African government's Department of Education, *The Shuttleworth Foundation*, and others. The organisation works with a combination of volunteers and paid translators. Through events like "translate-athons" the organisation recruits volunteers to participate. To date *Translate.org.za* has translated software such as Mozilla, Firefox, Thunderbird and *OpenOffice.org* into local languages. Through its online translation tools volunteers are also translating many other software applications into local laguages and even into other international languages.

Open source software is and continues to be a key component of the drive to equip Africa with the necessary skills to enter the information age. Open source software has also proved to be a very effective bargaining chip when dealing with

international software and hardware vendors. The ongoing efforts by projects such as *Translate.org.za* have been met with similar offerings by proprietary vendors that previously felt the markets too small to justify localisation efforts.

The *tuXlabs* project is a non-profit orgnisation that uses a combination of paid staff and volunteers to install Linux thin-client computers into schools in South Africa.[6] Originally started in the Western Cape province of South Africa the organisation recently expanded into other provinces and has installed approximately 150 computer laboratories since August 2003. Each laboratory typically consists of a central server and approximately 25 client computers. Anyone is able to volunteer for the project and one of the principles underpinning the organisation is that volunteers are taught basic skills through the hands-on experience during the installation process. These volunteers in turn teach other volunteers and after a pre-determined set of installations become eligible for free formal training provided by the Shuttleworth Foundation.

The most significant benefit of open source software is that it has opened the way for local communities to benefit from technology without losing their heritage. Users do not have to learn another language before they can use a PC. They are also able to customise the software to their own communal needs. And successful projects like *Translate.org.za* are easily reproduced in other other countries by other users.

5 Conclusion

Overcoming the digital divide in Africa is no easy task. Even the most basic efforts to deliver technology to Africa are frustrated by the overwhelming lack of infrastructure, skills and literacy. And yet there are pockets of hope where inroads are being made in developing skills and literacy. many of these efforts are being led by dedicated and determined organisations equally concerned with the needs of indigenous communities as they are with growing technology access. If there is one lesson in the challenges that Africa faces is that it is vital that technology projects on the continent focus on the values of indigenous communities as much as they do on delivering technology products.

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