The Information Revolution and Economic and Social Exclusion: the Experiences of Burkina Faso, South Africa and Tanzania

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Editor's Note

With pleasure we present to our readers the special series of UNU/INTECH Discussion Papers: Information Revolution and Policy Implications for Developing Countries. Papers of the Series were originally developed for the International Workshop on The Information Revolution and Economic and Social Exclusion in Developing Countries, held in Maastricht on 23 - 25 October 1996. The Workshop was an important event organized by UNU/INTECH and financed by the Dutch Government. Insights developed from the Workshop have not only been benefiting UNU/INTECH research work, but also contributing to many other initiatives in the area of innovation policy for information technology in developing countries.

There are six papers in the special series. The first five papers have been widely circulated and are provided here in the latest modified versions. These are outcomes from the two major themes set for the Workshop: ‘The Developments of Access and Effective Use of Information Technology and Exclusion’, and ‘The Gender Dimension in Exclusion’. The sixth paper, by Ludovico Alcorta, is a summary of the three country cases on Burkina Faso, South Africa and Tanzania organized for the Workshop.


#2002-2* Constantine Vaitsos, “Policy Agenda for the Information Revolution and Exclusion Phenomena in Developing Countries”


#2002-4* Carlos M. Correa, “Implications of Intellectual Property Rights for the Access to and Use of Information Technologies in Developing Countries”

#2002-5* Cecilia Ng Choon Sim, “Making Women’s Voices Heard: Technological Change and Women’s Employment with Special Reference to Malaysia”

#2002-6* Ludovico Alcorta, “The Information Revolution and Economic and Social Exclusion: The Experiences of Burkina Faso, South Africa and Tanzania”

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THE INFORMATION REVOLUTION AND ECONOMIC AND SOCIAL EXCLUSION: THE EXPERIENCES OF BURKINA FASO, SOUTH AFRICA AND TANZANIA

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1. INTRODUCTION

The information revolution, led by advances in information and communication technologies (IT), has already made a significant impact in the lives of the world’s population and has the potential to make even deeper transformations. The new hardware, applications and resulting services are already changing the ways individuals go about their daily home, work and leisure activities and the means they use to communicate with each other. For society as a whole the emerging technologies have helped to create new job and output growth opportunities, a global market, new forms of social organisation and an emerging ‘world’ culture. Fundamentally, the information revolution is providing businessmen, workers, governments and the public at large with the possibility of using an ever-growing amount and variety of information and knowledge. The capacity to benefit from the proceeds of the increasing availability of knowledge is, however, crucially dependent on accessing and effectively using existing information technologies.

Accessing the information revolution, or inclusion, is per force a relative concept. As Cooper points out in his chapter in this volume, even in the most ‘informatised’ of societies, one is always being excluded by the rapid pace of present day technical change. By the same token, even in the least of ‘informatised’ societies it is possible to find individuals or groups that have access to the latest IT hardware and applications available and thus benefit from up-to-date information and communication. Inclusion and exclusion are, therefore, a matter of degree. Yet, at the same time there seems to be a significant amount of the world population that have hardly ever come across a computer or been reached by the effects of the new hardware and applications. Indeed, by improving the capacity for making judgement by those that have access to IT the information revolution may also have the pernicious effect of widening the knowledge gap between the ‘have’ and the ‘have not’.

This paper aims at synthesising the findings of studies on Burkina Faso, Tanzania and South Africa studies addressing the issue of economic and social exclusion in developing countries.1 Three questions guided these studies: How far away from the information revolution are these

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1 The three studies by Bamogo et al (1996), Hodge and Miller (1996) and Wangwe et al (1996) were commissioned by the Institute for New Technologies, United Nations University and presented at an International Workshop on Technological Change and Exclusion. This paper, therefore, draws freely on the original contributions.
countries? What factors lead to existing patterns of inclusion and exclusion? What is being done to improve access? The regional focus on sub-Saharan Africa is purposeful, as it is in this region where the ‘distance’ to the information revolution would seem to be larger. It is, at the same time, the region with the largest potential for ‘leapfrogging’ into the information age, as there is little commitment to previous technology.

The paper will be structured into five sections. Following the introduction will be a section analysing the emerging patterns of inclusion and exclusion both internationally and domestically. The third section examines the investment, physical infrastructure, learning and market size factors accounting for such patterns. The fourth section discusses the potential for turning exclusion into inclusion arising from the market, government policies and international cooperation. In the final section some conclusions will be presented.
2. PATTERNS OF SOCIAL AND ECONOMIC EXCLUSION

2.1 The IT infrastructure base in international perspective

The quintessential hardware of the information revolution is, of course, the personal computer (PC). Although computers had already been around for some forty years it was only after developments in microelectronics in the early seventies, and the resulting increases in the performance/price ratio of microchips and in a vast array of applications, that their diffusion became widespread. Together with PCs, over the last ten years INTERNET has become a key source of storage and dissemination of private and public information. Finally, telephones have now become not only a major device for interpersonal and business communications but also one for accessing and transferring data.

The diffusion of personal computers (PCs) in Burkina Faso and Tanzania only began in the eighties but has proceeded at a very rapid pace since. In Tanzania, there were an estimated 470 computers, mainly PCs, in 1986. By 1995 the number had increased to an estimated 2,919 computers (Table 1) or one computer for every 9,832 inhabitants. In Burkina Faso, PC diffusion is slightly higher with an estimated 1,000 PCs in 1990 and 2,700 PCs at the end of 1995, or one PC per 3,474 inhabitants. There were no INTERNET hosts or users in either country in 1994 although attempts to establish them were beginning in both of them.

Table 1. Stock of computers in 1995

<table>
<thead>
<tr>
<th></th>
<th>Burkina Faso</th>
<th>South Africa</th>
<th>Tanzania</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal Computers</td>
<td>2,700</td>
<td>1,110,000</td>
<td>2,919</td>
</tr>
<tr>
<td>Micro-computers</td>
<td>25</td>
<td>10,327</td>
<td>n.a.</td>
</tr>
<tr>
<td>Mainframes</td>
<td>6</td>
<td>153</td>
<td>n.a.</td>
</tr>
</tbody>
</table>


Telephony in Burkina Faso and Tanzania is a state monopoly. In Burkina Faso the National Office of Telecommunications (ONATEL) is the unique operator for telephony, radio and television but licences are being granted to private companies for the supply of telecommunications equipment and maintenance aimed at businesses. Public and private efforts to increase telephony have resulted in the number of telephone lines increased from 7,947 in
1985 to 30,625 in 1995, around 333 inhabitants per telephone line. The Tanzania Telecommunication Company Limited (TTLC) is the main operator in Tanzania although permits have also been extended to two cellular mobile operators in Dar es Salaam. By 1994 there were 88,100 telephone lines installed, also around 333 inhabitants per line.

Private providers had added a further 2,500 mobile telephone lines by the end of 1995 but this was far less than the 145,000 applications for telephone lines that year (UNCTAD, 1997).

Despite the rapid increases in the stock of computers and telephones in Burkina Faso and Tanzania, available hardware would seem to be lagging behind that of most countries. In developed countries there were an estimated 5.7 inhabitants per PC in 1994, with the US having the highest ratio of 3.4 inhabitants per PC (UNCTAD, 1997). The equivalent figures for developing countries and Eastern Europe was 250 and 111 inhabitants per PC respectively. A similar pattern emerges with telephone lines. In developed countries one out of two inhabitants has a telephone line, while in the whole of the developing world and Eastern Europe there were 27.5 and 6.2 telephones per inhabitant. Hardware availability in Burkina Faso and Tanzania would seem to be trailing behind even if compared with the 238 inhabitants per telephone line in Sub-Saharan Africa. Together with Afghanistan, Bangladesh, Burundi, Cambodia, Central African Republic, Chad, Mali, Madagascar, Niger, Rwanda, Somalia, Uganda and Zaire, the two mentioned countries have the lowest access to IT in terms of PC, telephone and INTERNET use (UNCTAD, 1997).

Contrary to Burkina Faso and Tanzania, South Africa seems to be far more ‘included’. By the end of 1995 the ratio of inhabitants per PC was 40.6, similar to that of Chile, Mexico and Malaysia and not far from the world average of 28.6 inhabitants per PC (UNCTAD, 1997). Diffusion is also proceeding apace, with the number of PCs growing at an annual rate of 12.5%. Furthermore, the fact that 82% of the stock of computers is used by the business sector and that 60% of them are connected to a network, as compared with 65%-70% in developed countries, suggests that some businesses may be operating under very advanced conditions of PC usage and connectivity. Indeed, South African financial institutions are significant users of mainframes, PCs and automatic teller machines (ATMs) by international standards and one of its leading banks was placed in 1995 in the Computerworld Premier 100 users of IT world-wide. INTERNET use is also very advanced for the African region and the developing world as a

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2 The average waiting time for a telephone line in Tanzania is 10 years (UNCTAD, 1997).
whole, with an estimated 27,040 hosts and 148,720 users in 1994, figures similar to those of Denmark, Italy and Spain. By the end of 1996 there were around 88,000 hosts and 420,000 INTERNET users in South Africa.

As with most African countries, telecommunications in South Africa has historically been a state monopoly, although this is now changing. Fixed wire telephony was, until 1991, provided by the Department of Post and Telecommunications (DPT) and is today in the hands of the government owned company Telkom SA Ltd. Telkom’s establishment made it possible for main line installation to outstrip population growth and has averaged a 4.4% annual growth rate at the beginning of the nineties so that by 1995 South Africa had 3.8 mn telephone lines, an equivalent of one line per 10.5 inhabitants (see Table 2 for details). South Africa’s transmission network is extensive and is based on microwave, optical fibre, radio, copper wire and coaxial cable systems. International communications are handled through the INTELSAT global satellite system and South Africa is one of the hubs for transit and switching services for sub-Saharan Africa.

Table 2: Summary of Telecommunications Statistics in South Africa (1995/1996)

<table>
<thead>
<tr>
<th>Category</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Telephone Lines (thousands)</td>
<td>3,844.5</td>
<td></td>
</tr>
<tr>
<td>Business</td>
<td>1,325.1</td>
<td>34.5</td>
</tr>
<tr>
<td>Residential</td>
<td>2,459.8</td>
<td>64.0</td>
</tr>
<tr>
<td>Payphones</td>
<td>59.6</td>
<td>1.8</td>
</tr>
<tr>
<td>Telephone sets</td>
<td>5,300,000</td>
<td></td>
</tr>
<tr>
<td>Exchanges</td>
<td>2096</td>
<td>100.0</td>
</tr>
<tr>
<td>Manual</td>
<td>155</td>
<td>7.4</td>
</tr>
<tr>
<td>Automatic</td>
<td>1,941</td>
<td>92.6</td>
</tr>
<tr>
<td>Analogue</td>
<td>547</td>
<td>26.1</td>
</tr>
<tr>
<td>Digital</td>
<td>1,394</td>
<td>66.5</td>
</tr>
<tr>
<td>Lines connected to digital exchanges</td>
<td></td>
<td>70.0</td>
</tr>
<tr>
<td>Exchange capacity utilisation</td>
<td></td>
<td>82.0</td>
</tr>
<tr>
<td>Transmission Circuit (km)</td>
<td>120,209,000</td>
<td>100.0</td>
</tr>
<tr>
<td>(of which) Optical Fibre</td>
<td>233,000</td>
<td>1.9</td>
</tr>
</tbody>
</table>


In addition to Telkom there are three additional telecommunications networks, sectorally related. Transtel is the communications business unit of Transnet Ltd., the transport state-owned company that operates the national airline, the rail network and the harbours. Transtel’s communications infrastructure is reportedly the largest private network in Africa and consists of cable and microwave infrastructure, a direct dialling PABX voice network, data communications networks and trunked radio and mobile communications. Eskom is the state
company provider of electricity. Eskom operates a similar range of facilities and has expanded its network to support the power plants, substation and transmission lines located in rural areas. SANDF is the telecommunications infrastructure of the defence forces.

Cellular telephony began in South Africa in the early nineties and two licenses were issued, one to Vodacom (whose major shareholders are Telkom S.A. and Vodaphone), and one license to MTN (whose major shareholders are Cable & Wireless, M-Net and Transtel). South Africa has become the largest GSM market outside Europe and the fourth fastest growing GSM market in the world (Table 3). The market is now estimated to be between 650,000 to 700,000 subscribers.

Table 3: Number of Cellular Telephone Subscribers in South Africa, 1990-1995

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MTN</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>120,000</td>
<td>190,000</td>
</tr>
<tr>
<td>Vodacom</td>
<td>5,680</td>
<td>7,100</td>
<td>12,510</td>
<td>40,000</td>
<td>220,000</td>
<td>330,000</td>
</tr>
<tr>
<td>Total</td>
<td>5,680</td>
<td>7,100</td>
<td>12,510</td>
<td>40,000</td>
<td>340,000</td>
<td>520,000</td>
</tr>
</tbody>
</table>


Clearly, the South African physical telecommunications infrastructure is quite developed and is by far the best in Africa. Yet, South Africans are ‘excluded’ from the information age in a perhaps more frustrating way: the quality of the telecommunications service. The number of days required to activate a new service in areas where infrastructure exists has come down in recent years, but is still high at 29 days. In comparison, the top international operators take 3 to 5 days to activate new residential service and less than one day for a business service. More importantly, however, South Africa has an exceedingly high number of faults per 100 lines per year (90 faults), comparing poorly with the top operators who record fewer than 15 faults per 100 lines per year, making the telecommunications network, in practice, unreliable.

2.2 Local production of IT goods and services

Despite having been economically isolated for several years South Africa has not tried to develop a computer industry. It is estimated that around 95% of hardware revenues by distributors are from imported products and components. Yet, the country is not totally excluded from production, as a vibrant PC assembly industry is developing, propped initially by tariff differentials between built-up products and components and now by transport costs and the need to satisfy customer’s varying configuration demands. The industry operates on the basis of
flying or shipping PC components and sourcing cables and packaging locally. Around 60% of all PCs are assembled locally.

Parallel to PC assembly have emerged the IT professional services and the customised software industries as well as some research and development (R&D) capabilities. The professional services focus on the selection, installation, integration and maintenance of hardware, systems software and package application software. They also provide training and the analysis, development, implementation and maintenance of custom applications. The local software industry is aimed at specialised niche markets where local requirements differ from international standards. These include accounting, legal information and specialised financial service packages, logistics programs and various geographic and climatic monitoring software. Both industries are thus underpinned by the specificity and non-tradability of their products, a growing local demand for computers and the availability of a small but well trained workforce who is occasionally complemented with foreign professionals for very specialised and cutting-edge tasks. R&D capabilities are mainly in computer sciences, which accounts for 2.3% of total R&D expenditure in South Africa. Around two-thirds of this expenditure is funded by the business sector, suggesting that R&D efforts has industrial application.

Production of IT goods and services in Burkina Faso and Tanzania is practically non-existent. All Burkina Faso’s mainframe computers are imported by representative agencies of IBM or BULL while around 40 local companies import PCs. After-sales service including accessories, maintenance and training is always provided by the supplier. Only international commercial software is available locally and prices tend to be considerably higher than abroad. Until 1986 the government’s National Information Processing Centre (CENATRIN) held the monopoly of information processing services in the country, a situation that is now being undermined by the emergence of private companies with the capacity to process information for other users. CENATRIN is also the only local institution with software development capacities particularly for government applications such as civil servants payroll and fiscal accounting. In Tanzania software R&D is also restricted to a few government or government funded institutions such as the University of Dar es Salaam, the Commission of Science and Technology, the Bank of Tanzania and the National Bank of Commerce (NBC).
2.3 The use of IT applications

Another major component of IT is a vast range of hardware and software applications to specific circumstances. These applications are already aiding decision making and increasing the productivity, diversity and quality of areas such as education and training, health, public information and participation, finance, commerce, travel and entertainment and management.

Use of IT applications in Burkina Faso and Tanzania is heavily concentrated in the government sector. Ministries and public institutions are main users of office automation and other applications. Within government, the area of finance is the largest user. IT applications have been adopted for handling taxes and customs information, for civil servants’ payroll and for some other items of government expenditure. The Ministries of Education and of Science and Technology, in turn, have adopted IT applications to monitor the progress of schools and universities and have endowed some universities and research centres with library management systems and CD ROM literature search facilities. In Burkina Faso, between 1986-1991 a project to provide twelve secondary schools in different areas of the country with a six PC computing centre and a printer was undertaken. In Tanzania ministries such as Health and Infrastructure are using hospital management and geographic information systems and there are plans to introduce an automated property/land valuation system.

Government use of IT applications in South Africa is much more extended than in the other two countries although lower than in the business sector. Most ministries and public institutions have financial administration and personnel payments systems and national identification, patient registration and pension payment systems have been introduced. Several public offices have established web pages and a number of official documents, news and policy papers are available on-line. Some provinces are implementing the ‘one-stop-shop’ concept, where general information, statistics and governmental procedures are explained to citizens through kiosks and terminals conveniently located in the communities that they serve. The Department of Health is beginning an e-mail and communication system called HealthLink connecting doctors and sources of medical information and allowing the preparation of supply requisitions and statistical reports. The Department of Education is developing and supporting a number of initiatives using IT in education, including the connection to INTERNET of several schools in

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3 The average usage of PCs in the public sector is 7 per 100 employees as opposed to a national average of 15.7. Highest usage is in financial services, wholesale and retailing and manufacturing with 74, 24 and 17 PCs per 100 employees respectively.
areas of the Western Cape and the development of educational material to be used in the emerging network.\textsuperscript{4} IT use for university level distance learning is being promoted, particularly at the University of South Africa, which has around 50,000 students enrolled for this type of education and is the fifth largest open university in the developing world (UNESCO, 1996). An important initiative by the official Council for Scientific and Industrial Research (CSIR) is the Community Information Delivery System (CIDS). Although still in the pilot stage, this project is with the help of wireless satellite networking, connecting local nodes with no fixed line infrastructure in under-privileged communities around Pretoria. Users have INTERNET and distance learning coursework access, especially developed for them.

Government use of IT applications in South Africa is as advanced as in other upper middle income countries. A recent survey of potential and actual use of IT in developing countries by Mansell and When (1998) points at government administration, provision of public information and linking rural communities as the main usage areas, much in the way they it is used in South Africa. Also, applications of IT to patient care, often called tele-medicine, and to distance learning, including educational content, are at par with those in Brazil, Costa Rica, Malaysia, Mexico and Turkey.

South Africa’s government efforts in developing IT applications, however, are limited in other respects. Available hardware is outdated and consists basically of mainframe computers, which require time-consuming own systems development. Furthermore, the government infrastructure consists of a large number of networks unevenly spread across tiers of government and between departments. Efforts to link government offices through a national computer network are facing the insurmountable problem of insufficient bandwidth. The result is lack of structure and fragmentation of the information available, duplication of data and difficulties in communication between most computers in the network. In addition, where the computer facilities are adequate, they are not always efficiently used. For instance, the Department of Trade and Industry has 800 PCs linked together but only 30 staff members actively use available e-mail facilities for communication.

Turning to the business sector, IT applications are used by the largest, and often state- owned electricity, water, transport, finance and telecommunications monopolies in Burkina Faso and Tanzania. In Tanzania, for example, the government owned National Bank of Commerce,

\textsuperscript{4} There is no precise data on the usage of computers in secondary schools; generally schools in white areas are well endowed. In black urban areas government efforts and corporate sponsorship has resulted in a few schools obtaining basic computing facilities.
accounting for around 90% of all commercial banks deposits in the country, had automated all
call and time deposit accounts, international operations and overall accounting and clearing in
its cities’ branches (Vitor, 1995). Computer-aided-design (CAD) was used by engineering
consultancies and architect’s firms, particularly for public works projects; desk-top publishing
applications were used by large publishing houses, while a few news and media companies had
computerised their processes. Beyond this, there was not much use of IT applications by the
business sector in these countries.

By contrast, use of IT applications by South Africa’s business sector is far more developed.
Comparisons of international IT application use by manufacturing industry in US, Canada,
Brazil, Mexico, Europe and Japan show that South Africa lags in the use of product/process
applications such as CAD or Computer-aided-engineering (CAE), expert systems and factory
automation, but is highly advanced in the use of Manufacturing Resource Planning (MRP II)
and across functions information systems. However, these capabilities are concentrated in a few
large firms, with the bulk of medium and small firms lagging far behind.

Use of IT applications in wholesaling and retailing is fairly advanced among major chain stores
selling food, groceries, apparel, furniture and other household durables, even by international
standards. Pick & Pay, a major food retailer, has implemented a system that enables customers
to pay for purchases directly from their bank accounts. Point of sale terminals, which generate
simultaneously inventory, financial and customer behaviour information, are becoming standard
in most chain retailers. Retailers are also beginning to invest in more advanced data
management systems, in electronic commerce applications between members of the same
supply chain and in virtual retailing, including electronic catalogues and web pages.

Finally, use of IT in financial services is also fairly advanced. It is estimated that the sector
accounts for around 50% of the installed IT base in the country, with banking alone accounting
for 33% of total spending in IT. All major financial institutions operate nationally on the basis
of electronic networks and ATMs are available even in medium sized towns. Efforts to extend
the networks further into rural areas have resulted in the development by First National, a major
domestic commercial bank, of unique fingerprint recognition technology, which has already
won an international innovation prize.
2.4 The profile of the excluded

The description of the use and production of IT hardware and applications masks thus far the key fact that not all sections of society are included or excluded equally. Clearly there is differential access within studied countries depending on geography and race.

Taking geography first, a clear urban-rural divide is emerging. In Burkina Faso, around 87% of telephone subscribers are located in the larger cities, such as Ouagadougou and Bobo-Dioulasso, which also have digital switching exchanges. Out of the 15 switching exchanges available in the country only eight are digital. Analogue exchanges are in use in the smallest towns and surroundings and are well known for their poor sound quality and long connection times. In addition, there are 15 rural radio-based telecommunications networks that connect 143 stations in villages but can only be used for inter-personal conversations. Around 83% of Burkina Faso’s population lived in rural areas in 1997 (World Bank, 1999).

The extent of exclusion of rural areas does not seem to be very different in South Africa. Table No. 4 summarises household telephone access by location. Only one in twenty rural dwellings has access to a fixed telephone line, while the equivalent ratio in the cities is one in two. Of those rural dwellers without a telephone, 57.3% have to walk more than a kilometre to reach the nearest set. More than half of the rural population has no walking distance access whatsoever to a fixed telephone line. For most of these families a cellular telephone is just too expensive.

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5 Ouagadougou has, in addition, 30 kilometres of optical fibre links.
Table No. 4. South Africa: Household Telephone Access by Location and Race in 1994 (%)

<table>
<thead>
<tr>
<th>Telephone Access</th>
<th>TOTAL</th>
<th>Location</th>
<th>Race</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Urban</td>
<td>Rural</td>
</tr>
<tr>
<td>Telephone in Dwelling</td>
<td>31.1</td>
<td>50.8</td>
<td>5.2</td>
</tr>
<tr>
<td>Communal Telephone</td>
<td>12.6</td>
<td>14.5</td>
<td>10.1</td>
</tr>
<tr>
<td>Access to telephone at neighbour</td>
<td>7.8</td>
<td>7.3</td>
<td>8.5</td>
</tr>
<tr>
<td>Access to telephone at shop</td>
<td>12.9</td>
<td>6.9</td>
<td>20.7</td>
</tr>
<tr>
<td>None</td>
<td>35.6</td>
<td>20.4</td>
<td>55.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Distance to nearest telephone from dwellings with no set</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Less than 100 meters</td>
</tr>
<tr>
<td>100 – 200 meters</td>
</tr>
<tr>
<td>200 – 1000 meters</td>
</tr>
<tr>
<td>More than 1000 meters</td>
</tr>
</tbody>
</table>

Source: Hodge and Miller (1996)

Table No. 4 also depicts the extent of exclusion according to race in South Africa. Nearly nine in ten white South Africans have a telephone at home while for black South Africans the equivalent ratio is one in ten. Also, nearly one in every two black household dwellers without a set has to walk more than a kilometre to the nearest telephone set, while only one in five white dwellers with no set has to walk the same distance. On the whole, a rural black South African has either no access to a telephone set or has to walk a long way to get to one.
3. FACTORS LEADING TO EXCLUSION

3.1 Capacity to invest

One major factor restricting access to IT in the countries studied is the limited capacity to invest by the country as a whole, particularly in the cases of Burkina Faso and Tanzania, and by significant sectors of the population. Acquiring IT requires allocating a portion of national and personal income that may not be available or that involves choices with regards to satisfying even more pressing demands than the need for information.

Investment in IT in Burkina Faso between 1990-1995 averaged around 1.7% of GDP. It is estimated that the investment requirements for the period up to the year 2000 and from then to the year 2005, just to keep up with existing demand growth rates of IT, would range between 2-3% and 2.5-3.5% of GDP respectively. Already investing around US$ 40 million pa during the first half of the nineties involved a major effort for the country, given a very low savings rate and the country’s near complete dependency on foreign finance and aid at times when international funding to African countries was being curtailed. Indeed, the project of introducing PCs into secondary schools, which already had reached twelve schools, could not be extended to four other schools because of lack of finance. The fact that Burkina Faso is landlocked and that the transport infrastructure is weak, requiring air shipment of most of the equipment, only adds to the investment needs.

Burkina Faso’s IT investment predicament is compounded by more fundamental demands. According to World Bank (1999) figures, one out of three children under the age of five is malnourished and the life expectancy is amongst the lowest in Africa and similar to countries that have recently been involved in wars, such as Rwanda and Sierra Leone.

Only 18% of the total population have access to basic sanitation, while 22% of the population have no access to safe water. Agricultural labour productivity is the fourth lowest in the world. Under these circumstances it is not at all clear from a society point of view whether the country

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7 Gross domestic investment in 1997 amounted to 25% of GDP, of which only 9% was funded from domestic savings, the remainder being foreign finance (World Bank, 1999).
could afford, and will be able to continue to afford, allocating investment resources, even if they could be financed, to improve the IT infrastructure.

The limited capacity to invest is also evident in Tanzania. A survey of importers and suppliers of IT equipment pointed out at lack of finance as the major limitation in accessing IT. Of those interviewed, 56% pointed at this cause as very serious while 28% considered it as moderately serious. Firms are not generating the resources to be able to pay for IT equipment and even less so for maintaining and replacing what they already have. The low per capita income means that the average Tanzanian requires approximately eight years of work to be able to afford an up-to-date PC. At the aggregate level, Tanzania is also facing a low savings rate and high dependency on foreign funding together with the same stark choices in terms of basic need satisfaction as Burkina Faso.

Even South Africa is facing difficulties in financing upgrading its IT infrastructure. In 1996 the South African government decided to end Telkom’s monopoly over fixed line telephony and to open the sector to competition. The rationale underlying this decision was the need to improve on efficiency through competition and to raise additional resources to finance further expansion.

Telkom has been allowed to remain as a monopoly for six years in order to expand fixed line telephony into rural and black-populated areas. Telkom has developed its Vision 2000 Programme aimed at installing 4 million digital lines, 3 million new lines and 1 million replacement lines, by the end of its exclusivity period, which would double the size of South Africa’s existing network. The first stage is to install 1 million lines in some of the most under-served areas of the country and double them in a second stage. However, to achieve this requires the support of a strategic equity partner to provide the capital and knowledge necessary to implement Vision 2000. Telkom is also having to restructure itself through shedding non-core business and personnel and up-grading its skills in order to generate the profits and creditworthiness that will allow it to finance the new investments.

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8 In 1997 GNP per capita was US$ 210 in Tanzania and US$ 240 in Burkina Faso (World Bank, 1999).

9 Gross domestic investment in Tanzania in 1997 amounted to 21% of GDP of which only 3% was funded from domestic savings, the remainder being foreign finance (World Bank, 1999).
Lack of capacity to invest is apparent in South Africa in other ways too. The CIDS project, mentioned above, is facing difficulties to raise funding to move beyond the pilot stage. The project implies that disadvantaged communities will eventually pay for the services received and that private investors will be forthcoming in financing the expansion of the network. It is unclear, however, that even the communities presently involved in the project have the resources to pay for the cost of the connections and content, let alone those communities that have yet to experience the benefits of it. Hence, it is proving difficult to find entrepreneurs willing to invest and the government cannot afford to pay for the up-scaling of the project. Lack of funding also means that except for private schools and a few pilot projects here and there, it is not possible to massify the use of IT in support of the educational process in primary and secondary schools.

3.2 Human resources

Accessing the information revolution not only requires having the necessary funding but also an adequate supply of human resources. Making use of the information and communications potential involves basic literacy, as applications using icons and multimedia, although simplifying the use of IT, still provide most of the content in text. Fully processing the information available, in turn, requires basic analytical, communication and numerical skills that are normally learnt in secondary education. There is also the need for people with application-specific skills, which are provided through on-the-job training or vocational training. Finally, there is a range of technical and scientific skills necessary for activities related to maintenance at one end, IT training and education at the middle and programming and developing new applications at the other end.

Basic literacy levels and secondary school enrolment ratios in the three countries studied vary considerably. Despite having increased its expenditure in education as a share of GDP by 40% to 3.6% of GDP and doubling the share of relevant age group enrolled in primary school to 31% between 1980 and 1995, Burkina Faso’s adult (over fifteen years old) illiteracy rate was 71% for men and 91% for women in 1995 (World Bank, 1999). Only 7% of relevant age group attend secondary schooling. A major implication of these figures is that, at the moment, most of Burkina Faso’s population just cannot benefit from the information revolution even if they had all the required infrastructure available.
Literacy and secondary school enrolment rates in South Africa and Tanzania are, by contrast, far better. Tanzania has made immense efforts in improving its educational record, at least as far as its male population is concerned: by 1995 the illiteracy rate stood at 21% for men and 48% for women (World Bank, 1999). South Africa literacy levels have also been improving over recent years from an average of 74% for both males and females in 1980 to 82% in 1995 (World Bank, 1999). In addition, one out of two South Africans of the required age attends secondary school and the expected stay at school averages 12 years. Yet, the literacy rate among black South Africans is 77% compared to nearly 100% among white South Africans.

Computer training in Tanzanian secondary schools is limited to international private schools and a few state schools. In South Africa, around 17,000 students, or 1.6% of students in classes 8-10 (16-18 years) were taking computer sciences as a subject in 1992. This represents a 20.7% average annual increase over the 1988 figure. The highest proportion of enrolment in computer sciences between peers was among male and Asian students (Table No. 5). White students accounted for 69% of total enrolment in computer science courses although they only accounted for 2% of the total student population of that age.

### Table No. 5: Computer science courses student enrolment (classes 8-10) in South Africa, by gender, race and type of institution, 1988 and 1992

<table>
<thead>
<tr>
<th>Category</th>
<th>% of Group Enrolled</th>
<th>% of Total Enrolled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1.2</td>
<td>2.1</td>
</tr>
<tr>
<td>Female</td>
<td>0.7</td>
<td>1.1</td>
</tr>
<tr>
<td>Race¹</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>0.9</td>
<td>10.4</td>
</tr>
<tr>
<td>Black</td>
<td>0.02</td>
<td>0.01²</td>
</tr>
<tr>
<td>White</td>
<td>3.0</td>
<td>5.5</td>
</tr>
<tr>
<td>Total</td>
<td>0.9</td>
<td>1.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Institution</th>
<th>No. of Students by Institution</th>
<th>% by Institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>State</td>
<td>5502</td>
<td>72.5</td>
</tr>
<tr>
<td>Private</td>
<td>1273</td>
<td>16.8</td>
</tr>
<tr>
<td>Special³</td>
<td>816</td>
<td>10.7</td>
</tr>
<tr>
<td>Total</td>
<td>7591</td>
<td>100.0</td>
</tr>
</tbody>
</table>

¹ Excludes coloured population.
² 1991.
³ For the physically or mentally disabled

Source: Hodge and Miller (1996)

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Some efforts are being made in South Africa to develop voice-text conversion technology but is requiring significant financial, technological and linguistic efforts to adapt to the diversity of languages within the country, let alone to countries such as Burkina Faso and Tanzania.
Turning to the availability of professional human resources for IT, the differences between Burkina Faso and Tanzania on the one hand, and South Africa, on the other, could not be more startling. In Burkina Faso, only in 1993 did the first locally trained IT specialist emerge. Until then the country could count on less than 10 computer professionals mainly trained in France and in the African Institute of Information Technology in Libreville, Gabon. By 1995, the country had less than 300 computer specialists in all fields and levels of specialisation. Most of the available IT human resources are concentrated in ONATEL.

IT education and training is nowadays provided at university level as part of the curriculum of other specialities. In addition, engineering students with at least three years of higher education can become computer specialists by transferring to the College of Information Technology (ESI). The college is well equipped and has trained around 100 computer engineers since 1990 but there are serious concerns about the quality of the training, since qualified teachers are unavailable locally, and about the lack of areas of specialisation, particularly network design engineering.

Vocational training is provided by private institutions and on-the-job. Several private training institutes for programmers and network administrators have emerged. Entry requirements include two years of higher education and around 25 pupils per year obtain their certificates at these institutes but the qualifications of the teaching staff as well as the quality of the facilities have been questioned. Equipment and software suppliers also provide application use and technical training as part of their sales strategy. ONATEL, through its National Telecommunications Institute, provides training to its middle-level executive and technical personnel and most courses are open to outsiders. Finally, a major on-the-job training programme teaching government officials the use of computers has been undertaken. The programme has already reached 10% of all government staff and is being administered on a competitive basis by private and public training institutes.

Efforts to develop human resources for IT in Burkina Faso do not only face a qualitative constraint but also a quantitative one. Already in 1995 the supply of IT specialists, including only engineers, analysts, programmers and technicians, was estimated to be around half of the demand. More importantly, however, on the basis of projections of current use of PCs, Burkina Faso will require between 3000-3600 IT specialists by the year 2000. Also, the range of
specialisation will be broader to include, in addition to available areas, those of management of information systems and IT school teachers and university professors, something that existing education and training facilities do not have the capacity to do.

IT human resource availability would only seem to be slightly better in Tanzania. Although no figures are available, the market for IT specialists is characterised by shortage of relevant personnel, particularly at the professional level, high wages for the country’s standards and high rate of staff turnover. A survey of users of IT in Dar es Salaam found that at the level of managers of information systems around 43% of staff was foreign while at the level of systems analysts the equivalent figure was 11%. Programmers and technical support staff was local.

Graduate education in computer sciences and electronics is provided at the University of Dar es Salaam. However, the programs are not very popular due to the insufficient availability of academic staff, teaching materials and equipment. Dar es Salaam Technical College offers computer engineering and computer technology diplomas and courses and has been able to attract a growing number of students (see Table No. 6 for enrolment in IT courses). State-owned management schools offer IT specialities within their programs and the Eastern and Southern African Management Institute (ESAMI) offers short courses in systems analysis and design, programming and database and information systems planning.

State-owned management institutes and private companies all run short commercial courses on the use of specific applications, some of which are provided at the customers’ location. One major problem with IT diplomas and courses is that there is no national standard syllabi or an effective monitoring agency that could guarantee the quality of the delivery. As a result, there is great variability in what is taught and often the training does not produce the necessary computer skills. The Computer Association of Tanzania, a professional body grouping computer engineers and scientists, has been voicing its concern on this issue, so far to no avail.

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11 Senior executive training takes place mainly in France, Gabon, Senegal and Switzerland through programmes of development cooperation.
South Africa is much more gifted than its fellow African nations in terms of its IT human resources, both quantitatively and qualitatively. In 1995 there were an estimated 25,000 IT professionals, around 0.5% of the non-agricultural workforce and 48% higher than 1989. In 1992 the shares of IT professionals accounted for by programmers, system analysts, managers and others, including database administrators and IT consultants, were 32.2%, 36.8%, 11.4% and 19.7% respectively. Most of IT professionals are whites, who make up 83% of the industry while accounting for only 13% of the total population. Whites also hold a disproportionate share of IT professional jobs as compared with all professional jobs (Table No. 7). Also, males account for over two-thirds of IT professionals and this bias becomes more acute at the managerial level.

Professional computer science education is given at public universities, technikons, technical colleges and teacher training colleges. In 1992 there were 13,819 students enrolled for a computer sciences degree at a university, technikon or technical college, with enrolment growing at around 9% per annum. All of the growth, however, is accounted for by the latter type of institutions, as potential candidates for computer sciences at universities have switched to information management systems courses, normally given at other departments, with far better employment opportunities. There were only 314 computing science pupils at teacher training colleges in 1992, growing at a rate (12.7% pa) that was far below the rate of growth of the demand for computer courses at secondary schools (20.7% pa).
Indeed, despite the rapid increase in the number of IT professionals, South Africa still faces a shortage of IT personnel. Salaries for IT professionals are 6% higher than for other similar professions, although some specialities such as database administrators can command premiums of up to 20%. There is also a more rapid career development, with IT professionals taking 7-8 years to reach a managerial post as opposed to an average of 10-12 years for other professions. Vacancy rates of 3.3%, although falling, are higher than the national average. Indeed, surveys of IT professional services firms show that holding to IT personnel is extremely difficult due to supply shortages and competitive bidding from other companies.

In addition to public education, private colleges offer a range of IT courses. These include short up-to-a-week courses that seek creating computer literacy and knowledge of applications and are aimed at interested individuals, the unemployed and corporate clients. Also, they include medium term programming courses as well as occasionally professional IT qualifications fully accredited by the Ministry of Education. In 1993 there were 6114 students enrolled in around 60 courses. Private computer training courses is a fast growing area, expanding at 20% per year and estimates put the value of the industry at around R330 million in 1995.

### 3.3 Computer literacy

The potential to use IT does not depend only on the capacity of a country to invest and the extent of formal IT training, but also on the ability of the population to use the new
technologies. Although highly correlated with available hardware and formal training in IT at different levels, the concept of computer literacy attempts to capture the effects not only of formal IT education efforts but also of learning processes undertaken individually at home and collectively through on-the-job training and learning. Arguably, learning by doing is one of the main mechanisms of computer education and computer experiences are a key source in successful access. Hence, the concept of computer literacy is an attempt to measure the generic ability of people to tackle IT applications by themselves.

There are few scientific surveys of computer literacy. The only attempt known to have applied this notion in Africa, and exclusively to South Africa, is the World Competitiveness Report that tries to estimate the degree of computer literacy by surveying executives in several countries. The result of a survey of 10 develop and developing countries finds South Africa at the bottom end of the list with a computer literacy rating of 3.1 in a scale reaching a maximum rating of 10 (Table 8).

Table No. 8: Computer Literacy Rating in Selected Countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Rating (0-10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singapore</td>
<td>7.6</td>
</tr>
<tr>
<td>Japan</td>
<td>7.3</td>
</tr>
<tr>
<td>Chile</td>
<td>5.9</td>
</tr>
<tr>
<td>USA</td>
<td>5.7</td>
</tr>
<tr>
<td>Malaysia</td>
<td>5.3</td>
</tr>
<tr>
<td>UK</td>
<td>4.9</td>
</tr>
<tr>
<td>India</td>
<td>3.4</td>
</tr>
<tr>
<td>South Africa</td>
<td>3.1</td>
</tr>
<tr>
<td>Brazil</td>
<td>3.1</td>
</tr>
<tr>
<td>Pakistan</td>
<td>2.1</td>
</tr>
</tbody>
</table>

Source: Hodge and Miller (1996)

The figures from the previous table, however, are not informative as to the number of individuals that may be computer literate. In order to reach an estimate of computer literacy of the South African population it is necessary to consider that those younger than 5 and older than 65 by and large do not use computers. Given the availability of PCs at homes and schools and primary and secondary school enrolment rates it has been estimated that around 5% of the 5-18
year old population are computer literate. As to the working age group, only around 2-3% of those with primary and secondary education are computer literate, as most are unskilled informal workers and therefore have little access to on-the-job training and computers skills. Of those with vocational training, it has been estimated that around 40% are computer literate, given the group’s relatively higher levels of formal employment (41%), which is where the majority of South Africans learn their computer skills. Of those of working age and with tertiary level education, around 80% are computer literate as, with the exception of nurses and school teachers, who get little computer training, most other professions receive significant computer exposure. All in all, around 3.2 million South Africans or 7.7% of the total population is estimated to be computer literate, although the precise extent of their computer knowledge is far more difficult to ascertain.

3.4 Language ability

Even though the colonial heritage established some of the major international communication languages in the countries under study, their use is far from widespread, something that may be also leading to exclusion.

There is a great variety of languages and dialects being spoken in the three countries, all of which are not at all used for international communication. In Burkina Faso, for instance, around 80 tribal languages belonging to the Sudanese family of languages are spoken by 90% of the population. Tanzania too has a variety of home languages although Swahili is widely understood and generally used for communications while English is only used in commerce, administration and higher education. In South Africa there are eleven major home languages and, while English is taught in the majority of schools, the level of mastery required to make use of IT resources is far from sufficient. It is estimated that on this account alone around 42% of the South African population would be excluded.

It is also worth noting that the fact that the official language in Burkina Faso is French means that not all the information available through INTERNET, which is mainly English, is at the disposal of even the few users in that country.

Like in the case of voice-text conversion techniques, some research is taking place in South Africa on putting more IT resources in some of the other languages and developing language conversion software to translate English-based information. However, the first approach would provide access to IT resources only within limited regions of South Africa and not to those of
the rest of the world and hence probably will not be pursued. At the moment both options are being constrained by lack of financial and linguistic support given the small number of potential users and the several languages involved.

3.5 Apartheid

A major factor of exclusion of South African blacks from the potential benefits of the information revolution has been the apartheid regime. Apartheid was applied in multiple dimensions of economic and social activities and as such had also specific IT angle. Perhaps the best illustration of this is provided by the training of IT professionals.

Apartheid utilised two main interrelated mechanisms to exclude potential black IT professionals, namely, a highly unequal educational system and labour market entry restrictions. Inequalities in the education system materialised in the allocation of resources to black and white universities teaching computing sciences. The latter were endowed with hardware, software and library facilities comparable with newly industrialising countries and in some areas with those of developed countries while most of the former did not receive any allocation for this purpose. Lack of resources was also reflected in the nature of the curriculum offered in computer sciences and in the teaching staff available, with white universities being able to offer a variety of computer specialisations, advanced programming training and a combination of conceptual and applied training, while black ones could only offer more ‘generic’ and conceptual training.

As to labour market restrictions, particularly for management jobs, the most important ones involved either a bias for white universities during the recruitment process because of their better training or simply the outright rejection of a black applicant because of race. An indication of this was already shown in Table No. 7 as blacks accounted for only 3.4% of all IT professional jobs despite accounting for 33.4% of all professional jobs. Indeed, even after nurses and teachers are excluded, two of the professions that were completely open to the black population during apartheid and thus had a less skewed racial distribution of professional employment, black IT professionals accounted for 14.6% of all professional employment. It must be noted too, that the demand for IT professionals is geared towards young new entrants, something that also limits the access of young blacks who lived through the social and political turmoil of the eighties that resulted in even poorer education than that received by their predecessors.
4. MARKET AND PUBLIC RESPONSES TO ECONOMIC AND SOCIAL EXCLUSION

4.1 The role of the market

Markets have a key role in reducing social and economic exclusion and are already doing so. Markets can provide some of the information, products and services that are required by IT users. Markets can also assist with some of the training that is needed in order to access IT. Finally, markets can contribute with some of the specific applications that may help narrow the gaps between those with access to IT and those without it.

Tanzania’s Computer and Telecommunications System (CATS) group, for instance, performed its first mainframe installation in 1975 and was among the first companies selling software in 1987. Since, the company has diversified widely and has become the first distributor of Oracle and Microsoft products, the first to provide IT consultancy and turn-key projects and has established the first computer and IT training centre in the country. The company employs 130 professionals and seems to be profitable. Infotech Computers Limited is another case in point. Launched in 1989 by a Tanzanian entrepreneur as a hardware maintenance and training company, it has become an exclusive dealer for Siemens Nixdorf Information Systems and employs 25 professionals. In Burkina Faso, although fewer than Tanzania, there are similar companies providing IT products and training. Their number is, nonetheless, expected to grow as more IT users emerge.

In addition to companies dealing with ‘routine’ IT-related activities, there are a number of private efforts specifically aimed at ‘including the excluded’. One particularly relevant attempt is the containerised phone shops (CPS) established by South African subsidiaries of foreign telecommunications equipment manufacturers, such as SIEMENS or ALCATEL. The CPS consist of refurbished freight containers housing up to ten telephone booths that can be connected to GSM cellular network and through it to fixed lines. Each booth is equipped with its own radio equipment, a metering unit and a management system to monitor calls and set charges and can be installed in a matter of hours. CPSs have been installed in some rural communities and remain until fixed line telephony is received, after which, they are moved to other communities.
Also, these subsidiaries are locally developing technologies that reduce the cost of connecting fixed lines in rural areas. Linking geographically dispersed users usually requires large investments in cabling and equipment. Usually, telephones or small exchanges are connected to concentrators bringing together a number of lines, which in turn are attached to the public switching system. Concentrators are, however, expensive pieces of equipment that require large numbers of users to be profitable. To reduce costs the SIEMENS subsidiary in South Africa has developed smaller and cheaper concentrators to handle rural areas and a 1000 Km. optical fibre ring that connects these smaller concentrators directly into a larger, primary concentrator. This has made it possible to incorporate a number of previously unconnected rural areas into the fixed line network.

4.2 The role of government and public policy

While private companies can contribute to reduce social and economic exclusion, there are still a number of areas where state and public policy still has a significant role to play. Specifically, there are two areas where the government is already contributing and will continue to do so: provision of basic infrastructure and overall promotion, coordination and regulation of IT developments.

Taking the provision of infrastructure first, the small size of Burkina Faso’s local telecommunications market is forcing ONATEL to take a major role in attempting to modernise the telephone network. There are still a number of manual lines in rural areas that ONATEL has committed itself to replace by automatic lines. Also, around half of the exchanges are analogue and there are plans to convert all of them into digital so that lines throughout the country could be integrated and the speed and reliability of the telephony service improved. ONATEL has also set up the technical specifications and made a call for tenders for the supply and installation of cellular mobile communications equipment, initially to serve the Ouagadougou region and later to expand to other regions of the country.

ONATEL is also convinced that, whatever the short-term opportunity costs of investments in IT, the long-term benefits will far outweigh them and is carrying ahead with plans to provide access to INTERNET to as wide number of users as possible in Burkina Faso. ONATEL is beginning work for establishing a 64 Kbits/second specialised optical line to which private and public computer networks will be linked. ONATEL will be the owner and manager of a backbone line that is expected to be established nationally, although localised private service
providers will be allowed to operate on a commercial basis. It is intended that access to INTERNET will be eventually possible from the public telephone network as well as from cyber-centres to be located in different urban and rural sites.

Other measures undertaken by the Burkina Faso government to improve the establishment of infrastructure include a major investment in IT equipment for the public sector and a significant reduction of import duties for IT-related hardware as a means of stimulating the diffusion of the new technologies beyond the telecommunications sector.

The provision of basic IT infrastructure, particularly telephones, in South Africa is taking a different route. As was mentioned, Telkom has committed itself to add another 4 million lines by the year 2000 through its Vision 2000 programme. Indeed, Vision 2000 is part of a wider government plan to provide ‘universal access’ to IT. The plan also includes the expansion of the cellular network to rural areas by conditioning the granting of licenses to private firms providing a community telephone service in under-privileged areas at less than half the standard cellular rate. Between the two private cellular providers an additional 29,500 community telephones are to be installed in South Africa. On the basis of developments in fixed and cellular telephony, the government intends then to develop multi-purpose community centres across the country that would provide on-line information, IT training, small and medium enterprise support and community media and resources services. These centres would eventually be run on a commercial basis.

In order to attract more investment into IT infrastructure, the South African government will end Telkom’s monopoly over fixed telephony after the year 2002. New entrants are expected to compete in this market adding new switching networks and international services.

In addition Telkom’s shares will be sold to potential investors and the company may eventually be totally privatised.

Turning to the overall promotion, coordination and regulation of IT, a number of initiatives are beginning to take shape. Burkina Faso has already established an independent body, the Délégation Générale à l’Informatique (DELGI), to propose and implement IT policy. DELGI is involved in researching the diffusion of IT in Burkina Faso, is estimating the demand for IT equipment and human resources, and is spearheading the development of new IT professional
and vocational training programs. Its findings have been incorporated in the National Plan 1996-2000, which prioritises IT development after food and health. DELGI is beginning to take a leading role in disseminating information about the potential uses of IT in government, education and industry within Burkina Faso, developing INTERNET-based promotional content aimed at foreign tourists and publicising the Pan-African Festival of Cinema which regularly takes place in Ouagadougou. DELGI is attempting to assess the IT needs of government and to seek the necessary external funding to purchase the new technologies.

The absence of local private IT companies in Burkina Faso is also prompting policy makers to consider new incentive measures. In order to bolster the local assembly of computers and local software development, proposals are being made to the government to treat these activities as subject to promotional investment benefits. This would mean fiscal support for training and non-wage labour costs. It is expected that the benefits would encourage the emergence of several small and medium IT companies and the development of a local know-how in the field.

In contrast to Burkina Faso, Tanzania has no explicit IT policy. Indeed, until 1986 imports of computers and related equipment was banned on grounds that the country was not ready for them. With the decision to lift the import prohibition in 1986 came several efforts to design an IT policy, particularly by the Planning Commission in 1991 and the Communications Commission in 1996, recommending designing a national strategy to incorporate the new technologies, but few concrete recommendations and actions have come out from these attempts. The only measure taken so far in this direction was the reduction of import taxes on IT hardware and software in 1996.

The lack of official IT policy is prompting the private sector and non-governmental organisations to take a lead in suggesting policy initiatives. The private sector is requesting the government to reduce even further import taxes and red tape for IT products as well as to introduce tax incentives for purchases of IT goods. It is asking for an educational curriculum that integrates IT learning from early stages and for public investment into school computerisation. The private sector also wants a stronger commitment to local science and technology development and lower reliance on foreign expertise. For their part, non-governmental organisations, together with the private sector, are requiring the government to conduct the IT efforts of its different ministries under a single direction as well as to take a lead in bringing together IT specialists, professionals, users, suppliers and relevant official bodies.
IT policy formulation and implementation in South Africa is much more elaborate than in the other two countries. First, it is part of the Reconstruction and Development Programme (RDP), the overall blueprint for post-apartheid transition seeking to balance growth with development and redress the existing racial, regional and structural imbalances in the country. Second, it is embedded in a staged process involving the publication of a ‘green’ or initial discussion paper setting the basic ideas of a new policy, a ‘white’ or framework paper which is the basis for legislation in any field and finally an act of parliament. In the IT field the process has yielded a number of science and technology and telecommunications papers.

In essence, IT policy in South Africa seeks providing ‘universal access’ to all its citizens while at the same time delivering the quality and quantity of products and services required by an expanding economy. In addition to the gradual privatisation of Telkom, this means in the field of telecommunications the establishment of a ‘Universal Service Agency’ in charge of promoting affordable and accessible service in historically disadvantaged communities. The agency will be funded from a levy to be imposed on all fixed and cellular telephone carriers.

Access to IT products will be made more affordable by gradually phasing away any protective measure of local IT products that is inconsistent with the World Trade Organisation (WTO) agreement. However, the government intends actively to promote the exports of South African IT goods, services and technology, particularly within Africa, where it believes the country has unique assets and the ability to develop and deliver African solutions. Indeed, the containerised phone shops developed by Siemens are already being exported to Angola, Burkina Faso, Burundi and Tanzania.

Given that the private sector will take on the lion’s share in the development of the telecommunications and information services industries, the government has also established an independent regulator called the South African Telecommunications Regulatory Authority (SATRA) which will monitor telecommunications on behalf of the public interest. SATRA has also the task of developing human resources for the telecommunications sector through the promotion of interest in IT at school level, training of workers and technicians, designing undergraduate and post graduate educational content and by engaging in relevant research.

Finally, the government has engaged in several major national and international IT initiatives. The first one is the National Information Project aimed at digitalising and harmonising all
available government information. The second one is a complete review and assessment of current information management policies and resources within the public sector. The third initiative is the Research and Technology Foresight Project that includes a focus on IT. This project seeks identifying the key technologies and market opportunities that are most likely to generate benefits for South Africa, developing consensus among the different stakeholders involved in IT development, coordinating research activities and reaching agreement on the actions that are needed to reap desired rewards. Last but not least, the government is actively taking part in shaping what is known as the Global Information Society, i.e. the international forum for discussing and seeking ways of implementing global access to the information revolution. South Africa organised in 1996 a G-7 conference bringing together delegates from government, business and civil society to examine how to reduce the IT gap between developed and developing countries. Since, South Africa has been involved in several follow-up pilot projects aimed at finding technical solutions to existing disparities.

4.3 The role of the international donor and funding agencies

Foreign bilateral and multilateral donor and funding agencies have played a major role in the diffusion of IT, particularly in Burkina Faso and Tanzania (Derniame, 1996). Although no figures are available specifically for IT, an indication of the extent of foreign donor financing for IT hardware and software can be obtained from the ratio of aid to total goods imports. In 1996 the proportion of merchandise imports ‘financed’ by foreign aid amounted to around 55% (World Bank, 1999). Given the limited capacity of these countries to invest and to generate foreign exchange by these countries, there is no doubt that foreign donor agencies will continue to have a key role in the diffusion of IT.

Foreign aid promotes the diffusion of IT by directly funding the acquisition of IT products or through the IT component of most aid projects, as budgets are allocated for computers and related services. For many this is the only means of access to IT. The equipment, software and personnel, however, normally originates or is built to the standards of the donor country, something that is not always relevant to the recipient country nor bodes well for the compatibility of available hardware. Training is provided with different ‘IT philosophies’ in mind complicating even further the possibility of identifying solutions that are widely applicable nationally. Sometimes the objectives and aspirations of donors and recipient institutions do not coincide resulting in unwanted and, as a consequence, unused equipment. Once donor funded projects end, it is difficult to keep the new technologies operating and even more so, to maintain knowledge acquired around them.
Local non-governmental organisations in Burkina Faso and Tanzania have also taken the lead in requesting governments and donor agencies to take into account these factors in formulating their IT policies. Suggestions have been made to governments to monitor, and if necessary to regulate, the flow of IT to avoid unnecessary diversity. It has also been suggested that donated IT equipment and training programmes must always involve a ‘local adaptation’ component. It has been pointed out that it is necessary to introduce mechanisms that ensure intense communication between stakeholders and donors during the lifetime of projects and the continuity of technology and acquired knowledge long after projects have been completed. Donors for their part are being requested to incorporate into their project designs the needs for IT homogeneity in recipient countries and adaptation to local circumstances.
5. CONCLUSIONS

Two patterns of exclusion/inclusion would seem to be emerging in the studied countries. On the one hand, there is a pattern of ‘basic’ or ‘fundamental’ exclusion, as exemplified by Burkina Faso and Tanzania. In these cases, although there is some local availability of IT hardware and applications, the number of computers and telephones is so small and quality of telecommunications infrastructure and services so shoddy that they cannot provide the minimum levels of information and knowledge required for improved judgement and, hence, for enhanced economic and social prosperity. Exploiting the content of the information revolution requires a critical mass of users and levels of literacy, language proficiency and data processing and analysing skills that are not widely available in these societies.

‘Network externalities’, i.e. the benefits obtained by initial members from increasing the number of participants in a network, cannot be reaped because the users are relatively few and the IT resources so scarce, and will continue to be so for some time despite the initial rapid growth given the extent of financial requirements, that they are not able to generate synergies and to become pervasive.\(^\text{12}\)

On the other hand, there is a pattern of ‘limited inclusion’ as in the case of South Africa. There is access to a wide range of IT hardware and applications and there are some areas of international excellence. There is also public and private commitment to make access to IT as widespread as possible, including developing special purpose and innovative applications, investing in human capital and leveraging the business potential of the new technologies to create resources for the ‘excluded’. Yet, the quality of access is limited throughout while its distribution is highly skewed towards the minority of the population. Black South Africans have been particularly marginalised from the information revolution.

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\(^{12}\) Bedi (1999) provides the following example: “..., consider a project that permits e-mail access to additional subscribers. New subscribers derive benefits from these services, but so do all other subscribers already connected to the system. The expansion of the system allows all earlier subscribers to communicate and exchange information with new subscribers and vice versa. Thus the gains that accrue to each subscriber rise with the number of other individuals and organizations that have access to the system.” (pg. 5). It follows that maximum gains are only achieved when all potential users are connected to the system.
Reducing the ‘distance’ to the information revolution will continue to require the concerted effort of private and public institutions, non-governmental organisations and the international donor community. Private firms’ role is to exploit arising market opportunities while at the same time creatively generate new technical and business solutions that are applicable to local circumstances. Governments will have to create an enabling environment for IT individual and institutional initiatives to emerge while at the same time provide overall direction and regulation to the acquisition of IT, the necessary basic research and IT focused schooling and training. Non-governmental organisations, in turn, will have to partially bridge the demands and promote dialogue between society at large and key actors. International donor agencies will have to take into account more systematically the local needs in their IT transfer programmes while continuing to be a major provider of funding for new technologies, particularly in basic exclusion situations.
6. BIBLIOGRAPHY


