Chapter 4
A Decade of e-Development in South Africa: Sufficient for a "Services (R)evolution"?*

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South Africa Economy and Society: A History of Mobility and Rise of a Services Economy

South Africa's history is one of migration and mobility, due to successive centuries of continental migrations, its colonial history, the separate development policies pursued between 1948 and 1990, its social diversity and its relative political openness. During previous centuries, migration and mobility were key features of South Africa with workers migrating from rural areas and neighbouring states to the mines and towns to work, often in menial, low-income jobs. In the late nineteenth and twentieth century, mining and subsequent manufacturing activity laid the foundations for the growth of a services economy. Following democratisation in 1994, South Africa became an attractive destination for the mobile middle class and for people working in service industries across the continent. These and other trends laid the foundation for the emergence of an era of mobile communications in Africa.

For the purposes of this discussion, mobility arises when economic conditions require the constant movement of people outside a fixed workplace, in order to engage in economic activity. Thus, economic mobility could be between the workplace (including home) and a range of other points in an economic network, or between the home and several constantly changing points in a geo-economic space in order to facilitate the flow of goods and services. Mobility, in this sense, is more typical

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of economic activities in the services sector than in the agricultural, mining or manufacturing sectors. It is the services sector that requires workers and consumers to be mobile in order to provide or receive a service. Since people in this sector are highly mobile, they can benefit significantly from services that are mobile, facilitated by mobile communications technologies. This relationship between mobility, communications technology and the services sector is an important perspective from which to look at South Africa. This is because the services sector is the largest contributor to GDP at around 66% as compared to manufacturing at 14.8%, mining at 9.6% and agriculture at 2.5% (AfDB 2011). It shows the highest contribution to annual GDP growth and it is the most innovative sector, the sector which is most undergoing transformation from a linear industrial model into a virtual adaptive-network model. Manufacturing and agriculture have been in decline over the period 2005–2010 and even before that, limiting their sectoral impact on economic growth. Thus, while Information and Communication Technologies (ICTs) in manufacturing and agriculture are important, these sectors are unlikely to be the sites of e-transformation of the economy in the next 2 decades.

What is today the City of Johannesburg was founded on the migration of people from across continents, just a little more than 130 years ago; and in 2011 Johannesburg, the most populous part of South Africa with more than 3.5 million people, experiences significant in-migration from other provinces and from the continent at large. People of many origins live and work in this city and seek increasingly innovative and affordable ways to communicate with families and households remaining elsewhere. Similarly, entrepreneurialism in a middle-income economy requires mobility in order for small traders to secure income, as well as for large corporations to conduct business in overseas markets. Six million South Africans have Internet access on their phones. Of these, 39% of urban users and 27% of rural users are browsing the Internet on their phones (Goldstuck 2011). Given the attractiveness of mobile devices, features and applications to consumers, South Africa's future economy and society may come to rely more on mobile voice and data communications for its development than it does today.

South Africa's industrial economy is concentrated in six metropolitan municipalities, including Johannesburg, Tshwane, Ekurhuleni, Cape Town, eThekwini and Nelson Mandela Metro.[1] The services sector fans out from these highly urbanised centres to the lesser-known regions of rural KwaZulu-Natal, Mpumalanga, Limpopo and the Eastern Cape, providing an income base and other economic flows for firms and households, including low-income households and small-scale rural businesses. The economic expansion of these rural geographies, which are largely dependent on services sector activity, requires, amongst other resources, affordable access to ICT infrastructure and electronic services, including high bandwidth services, in

[1]Ekurhuleni and Tshwane are two of the three metropolitan municipalities in Gauteng province. Ekurhuleni incorporates the historical manufacturing hub of the East Rand, while Tshwane incorporates the city of Pretoria and the administrative centre of national government. eThekwini is in the KwaZulu-Natal province and includes Durban; Nelson Mandela Metro is in the Eastern Cape province and includes Port Elizabeth.

order to access and create economy-relevant content, knowledge and trade opportunities. Furthermore, there are significant levels of mobility between the metros and the less-urbanised areas, seeing regular movement on a daily and weekly basis, in addition to mobility amongst that section of the population that travels to the rural home base once a year.

In this chapter, the following three questions are posed: How well is South Africa positioned in terms of its e-development? How does South Africa fare with respect to its policy leadership and performance of the key institutions that contribute to e-development? Is the level of e-development sufficient to promote socio-economic transformation through a "services revolution"? The concept of "e-development" is used here to signify a time in which societies advance due to the socio-economic effects of very rapid information flows, and development is enhanced through the integration of digital information and communication technologies in the economy and everyday life.

The chapter adopts Hanna's e-development analytical frame (Chapter 1), which depicts the linkages amongst key elements of e-transformation, namely the relationship between leadership through policies and institutions, ICT industry development, information infrastructure evolution, human resource development and advances in e-government, e-business, e-society. Hanna observes the centrality of leadership in the complex processes of change, from societies formed through many centuries of industrialisation, towards societies in which economic success and social well-being is increasingly shaped by the rapid digital communications. It can be inferred from this particular view that weaknesses in leadership by policy or regulatory institutions will negatively affect the progression of e-development and the value gained by particular social and economic constituencies. The chapter uses this framework to analyse data from ten distinct studies conducted by the authors over the period 2009–2010.

It further acknowledges Melody's (2002a) analytical frame with respect to the information society, which emphasises the role of ICT in facilitating development in services-based economies. Melody's framework, incorporating a requirement to review information infrastructure, e-society, e-business and e-government, is useful because it draws attention to the predominance of the services sector in the twenty-first century economy. This is certainly applicable to South Africa, where the growth and strengthening of the services sector has played a significant role in economic development in the last 2 decades.

The State of e-Development

South Africa is comprised of nine provinces (See map in Fig. 4.1), has a population of 49 million people and billion. South Africa's 2007 investment climate profile (AfDB 2009, pp. 314–315) gave mixed views on the quality of infrastructure and innovation, reporting that only 36% of firms were using the Internet to interact with clients and suppliers, while only 12.4% of firms were using technology imports,

Fig. 4.1 Map of South Africa. *Source*: www.places.co.za

including communications technology imports, in their businesses. It is necessary to dig deeper into the state of ICT infrastructure and services to see a clearer picture of e-development as it emerges.

Information Infrastructure: Network, Services and Media Sectors

The South African telecoms sector is characterised by having only a few players, hence limited competition and high market concentrations in major market segments. There are three firms operating in the fixed-line market (Telkom, Neotel and Dark Fibre Africa), four in the mobile market (Vodacom, MTN, Cell C and Telkom) and three firms or consortia in the undersea cable market (Telkom, Seacom and the Eassy consortium of telecoms operators which incorporates a special purpose vehicle for Internet service provider [ISP] participation).

Only since 2009, have all telecoms players including ISPs been licenced to build their own network infrastructure, prior to which service providers were required to lease their facilities from the incumbent operator, Telkom, at high prices.

Infrastructure for mobile communications has been deployed over the past 16 years, densely in the metros and towns, with increasing reach to small towns and rural villages, as well as along national and provincial arterial roads, the main purpose being to connect visitors to South Africa's attractive nature and eco-tourism spots.

The market for value-added services in South Africa is largely composed of Internet access and services and wireless applications services. The ISP market has matured over the last 15 years and there are an estimated 726 ISPs operating across the country. The wireless applications market has approximately 250 service providers, offering an open field for innovation in, for example, redesigning Internet applications for the mobile/wireless telephony environment and creating mobile commerce solutions. This market is likely to develop substantially in the next decade with regard to business ICT services.

South African Internet users are now served by three undersea cable systems effective 2009, the Eassy and Seacom cables landing on the KwaZulu-Natal north coast linking South Africa to the Middle East, with onward connections to the UK and India; and the SAT3/SAFE system with landing points at Melkbosstrand and Mtunzini, linking South Africa to Europe and the Far East. The WACS and ACE cables are scheduled to bring in even higher bandwidth from 2011. The 80 Gbps capacity available to the African continent in 2008 was upgraded to 5.4 Tbps by 2010 and is scheduled to be 17 Tbps by 2013, of which 8.4 Tbps will be available to South Africa (Goldstuck 2010, p. 47) (Fig. 4.2).

Broadband (ADSL) and mobile broadband (3G) technology lagged behind the introduction of Internet-based services such as online banking, travel and accommodation bookings, research and educational content in the early part of the decade, the irreversible shift from low-bandwidth dial-up to broadband becoming a feature of the communications landscape only in 2008 (Goldstuck 2010, p. 136), opening up the market for electronic services. Broadband provisioning is a highly concentrated market, fixed broadband is offered by Telkom and Neotel, fixed wireless broadband by Telkom, iBurst and Sentech and mobile broadband by Telkom, Vodacom, MTN and Cell C. Most ISPs are offering fixed broadband services, however, this is usually reselling Telkom's ADSL services, as local loop unbundling has not yet been regulated. Municipal broadband infrastructure has been built or is in the process of being built by four metropolitan municipalities including Johannesburg, Ekurhuleni, Tshwane[2] and Cape Town, but service provision to firms and households has yet to be launched. Fixed and mobile broadband packages with a data transfer limit from as low as 50 MB to as high as 10 GB are on offer and mobile broadband has rapidly become the preferred mode of access away from the workplace. The maximum speeds on these packages range from 384 Kbps to 10 Mbps for fixed-line broadband, and from 1 to 42 Mbps on mobile broadband. These are theoretical maximums and are seldom

[2]Ekurhuleni and Tshwane are two of the three metropolitan municipalities in Gauteng. Ekurhuleni incorporates the historical manufacturing hub of the East Rand towns, while Tshwane incorporates the city of Pretoria and the administrative centre of national government.

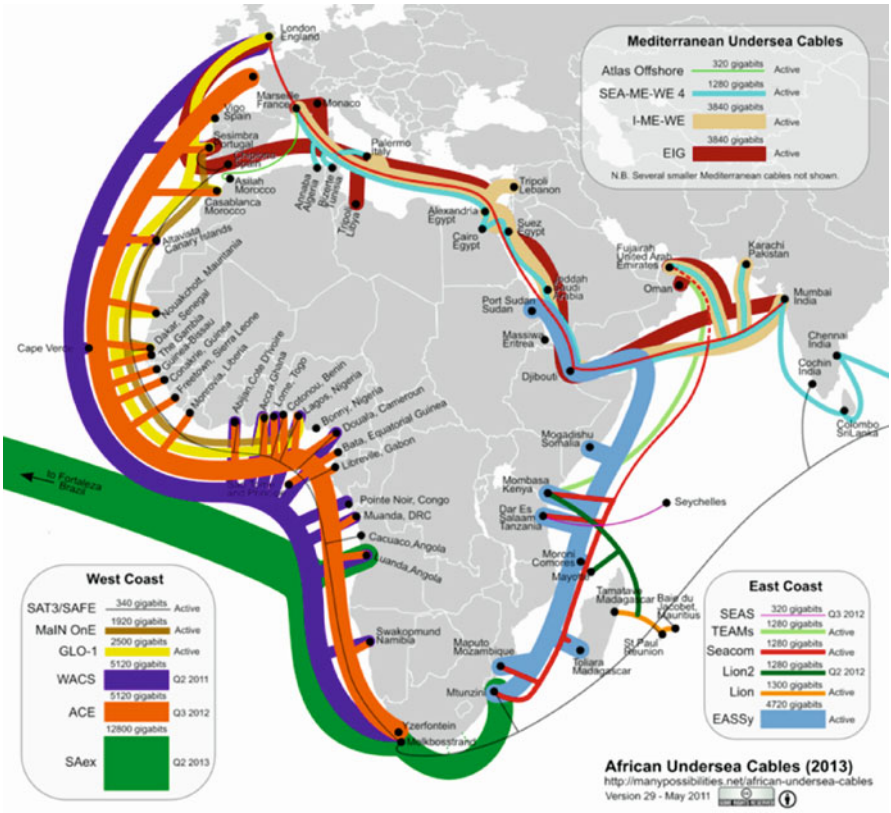

Fig. 4.2 Emerging undersea cable system for Africa (South Africa). *Source*: Song (2011), http://manypossibilities.net/african-undersea-cables/

seen in practice. Figure 4.3 illustrates the increase in broadband access between 2003 and 2010 and it is estimated that there will be 3.5 million unique broadband users by end 2011.

A crucial area of technology development and regulatory focus for an increasingly mobile national and continental population is the management of the radio-frequency spectrum, specifically the assignment of spectrum for mobile and fixed broadband services. Following initial award of GSM spectrum licences (900 MHz) to Vodacom and MTN in the 1990s, spectrum assignment has only again begun to receive attention in the last decade, with mobile operators being given licences to operate in the 1,800 MHz band (GSM) and the 2,100 MHz band (3G). Neotel was awarded a licence to operate CDMA in the 800 MHz band and licences were awarded to iBurst, Sentech and the two fixed-line operators for wireless broadband services (WiMAX) in the 2.6 and 3.5 GHz bands (Song 2010). Freeing up of spectrum for novel uses and technology innovation in, for example, cognitive radio is beginning to emerge on the agenda, but the pace of e-development here remains slow.

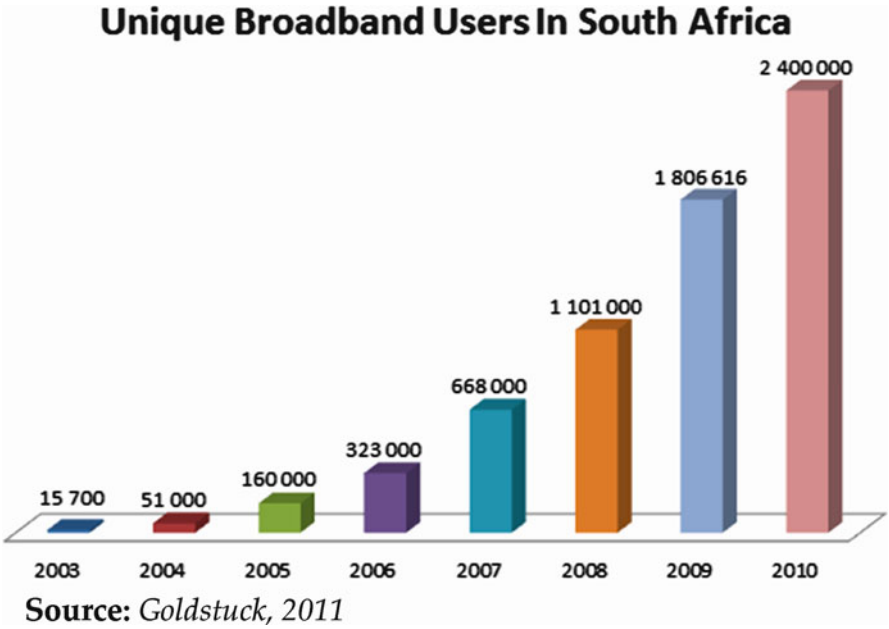

Fig. 4.3 Exponential increase in broadband usage 2003–2010. *Source*: Goldstuck (2011)

A range of broadcast and value-added electronic services (Internet, other) are available, connecting a proportion of South African firms and households to global communications and to the services sector, though lack of affordability means that the majority of households do not have access to digital content and programming. The local broadcast market comprises the multimedia network operator and broadcast network provider, Sentech; the multi-channel South African Broadcasting Corporation (SABC, 15 public broadcast radio stations covering all 11 languages[3] and 3 commercial radio stations), free-to-air station eTV and satellite subscription service provider Multichoice Holdings. In addition, there are 13 licenced private commercial radio stations and 126 community radio stations. Four pay-TV channels were licenced in 2007, including TopTV a competitor to DStv. However, there is no effective competition in the pay-TV market. Strong local contender Telkom Media, a subsidiary of the incumbent telecoms network operator, struggled to develop a viable business model, was bought out by a Chinese investor and, now called Super 5 Media, was granted a third 6-month extension to launch broadcast services by the regulator, ICASA, requiring it to begin by September 2011. Lack of competition in the sector means delays in bringing innovations such as video-on-demand, IPTV and other interactive digital media to South African audiences.

[3]Languages are Afrikaans, English, IsiNdebele, IsiXhosa, IsiZulu, Sesotho, Sesotho sa Leboa, Setswana, siSwati, Tshivenda and Xitsonga.

Radio and TV broadcasting is still a largely analogue environment for the majority of the country's viewers. South Africa's broadcast infrastructure is more than 15 years old, but not yet obsolete. Digital migration stalled during 2009–2010 because of policy inconclusiveness regarding the choice of a digital migration standard. The DVB-T2 standard has now been adopted by South Africa and the SADC region and the original switch-on date scheduled for November 2008 was delayed until December 2013. Much remains to be done to ensure that South African households will be able to receive the digital signal, requiring government to address possible subsidies for up to 4.5 million set-top boxes to address the needs of the 10% of households who do not access TV due to reasons of lack of affordability.

Slowly, the historical bottlenecks in Internet access are being opened. In 2007–2009, broadband emerged as a key network infrastructure. In 2009, competition emerged in the undersea cable market enabling market segments like universities to access cheaper bandwidth through their consortium, TENET,[4] though consumers are not yet benefitting from affordable international bandwidth due to continued high retail prices. Furthermore, in 2011 initiatives in spectrum policy and regulation may open up the availability of this scarce resource. Collectively, these features could create a new landscape for e-development, but this future is still vague and uncertain. Looking back over the first decade of the twenty-first century, we may see a greater number of inhibitors than enablers of e-development. Future policy initiatives will need to address the necessary linkage between e-development on the one hand and the major areas of economic activity, namely (r)evolution in the services sector.

ICT Industry Development: Co-Evolution with the Services Sector

The information technology sector is a highly competitive industry, characterised by many players building IT networks for corporate business, for government and large organisations like universities and with an extensive range of firms offering software and services. There is only very small-scale local manufacturing of electronic goods, but South Africa has the benefit of increasingly affordable electronic devices due to bulk importing.

The IT market, led by multi-nationals like IBM, Cisco and Tata[5] and local companies like Dimension Data and arivia.kom,[6] was estimated at USD9.5 billion in 2010 (BMI 2010, p. 1), with more than 2,428 companies and a workforce of 141,929 people operating across the hardware, software and IT services markets (Schofield 2009, p. 2). The total ICT workforce is significantly larger when we include firms across all sectors that employ ICT workers, but there remains a significant skills shortage.

[4]Tertiary Education NETwork, a consortium for universities that buys bandwidth at wholesale prices.

[5]Through its indirect subsidiary Financial Network Services Pty Ltd. (Africa).

[6]Two of the top five companies in the IT sector.

The sector enables the increasing utilisation of ICT goods and services as tools for business operations, communications and transactions. South Africa's large and medium-sized companies have extensive digital operations, incorporating converged services across IT, mobile voice and Internet platforms. On the other hand, small companies, employing 50 people or less are more limited in their deployment of IT, using only the minimum requirements, except in sectors such as tourism where both voice and Internet are necessary business requirements. The top three areas for ICT priority usage in firms in 2009 were ranked as follows: application development, network infrastructure, and business intelligence/knowledge management. Other areas of usage include customer relationship management, information security, mobile computing, software as a service and web development (Schofield 2009, p. 3). Provincial and metropolitan level government and public sector institutions are large-scale IT users, effectively utilising electronic document management systems rather than paper bulk storage systems. But, smaller sub-national governments have fewer resources due to a lower tax base and hence are less likely to have IT integrated into or facilitating their operations.

South Africa has historically had a software development capability, but this has remained at a very low level of maturity, with the software industry operating largely at CMMI level 1, though a few individual firms may operate at a higher level.[7] A larger proportion of IT practitioners worked in the software than in the hardware environment in 2009, 46% as compared to 35%, designing bespoke solutions, database management systems and e-commerce solutions, and implementing packaged solutions (Schofield 2009, p. 8). For 15 years, the IT sector has been a co-creator of firm-level capacity to generate innovations in banking, online retail, tourism and hospitality and other services.

Innovation in the economy is a necessary condition for development, thus also for e-development where ICT can enable innovation in the services and other economic sectors. How well does South Africa wear the label of being an "innovative developing country"? In the most recent year for which comprehensive data is available (2008/2009), gross expenditure on R&D was 0.92% of GDP[8] or approximately ZAR21 billion, placing South Africa below China and the Russian Federation, but higher than India in terms of GERD; there were 1.4 full-time equivalent (FTE) researchers per thousand of the workforce and a total of 19,384 FTE researchers, 39.7% of whom were women (DST 2010, pp. 9 and 13). In the period 2000–2009, South Africa created an increasingly innovation-oriented business and academic environment, consistently increasing its annual R&D expenditure by almost ZAR2 billion per annum. However, the global financial crisis slowed innovation investment between 2008 and 2010. As reported in a recent science and technology indicators

[7]CMMI or Capability Maturity Model Integration is a framework for software management, where at the initial level 1, performance of the software is unpredictable; while at the highest level 5, software engineering process improvement is institutionalised.

[8]GERD is the gross domestic expenditure on research and development as a percentage of GDP.

report (NACI 2009, pp. 20–21), the country's research effort[9] is highest in the geology, petrology and mining fields (activity index 7.7), but low in computer science and engineering; information technology and communication systems; artificial intelligence, robotics and automation; electrical and electronic engineering, where South Africa's innovation activity is considerably lower than the world average (activity index between 0.3 and 0.5 for these fields).

Innovation adoption is moderate, as can be expected in a developing country where innovations are attractive, because there is considerable need for new productive technologies and new services, but they are not necessarily affordable. Given that, innovation adoption is dependent on income for both firms and households, those innovations which will bring the greatest returns per investment rand are likely to be most attractive. Thus, the relative power of communications technologies, as against their cost of adoption and use, positions ICT as an early adoption technology, as compared to health or other production technologies.

ICT-enabled innovation has been most observed in the services sector, a key sector promoting economic growth throughout the 1990s, laying the foundation for further growth in the twenty-first century. While value-added in all economic sectors grew steadily between 1970 and 2007, value-added in the financial and insurance sectors increased fastest overall, particularly after 2000. The financial services sector contributed 17.3% (nearly one-fifth) to GDP in 2007, including exports of services to the value of ZAR16.4 billion. There is also consistent foreign direct investment in the attractive retail banking sector (TIPS 2009a). This strong sector growth occurred during a period in which mobile and Internet banking were not yet as popular channels as they are in 2011. Nearly a decade of growth in real gross domestic fixed investment in financial services between 1999 and 2007 has helped to build a financial services sector with a well-integrated electronic services component, including an informational dimension and a transactional dimension. However, South Africa has not developed a broad services sector strategy, despite attempts to do so in 2004–2008 and innovation strategy does not focus on the services sector.

The third largest component of the services sector is wholesale and retail, hotels and restaurants, contributing 14% to GDP. The sector is relatively volatile in income terms and is easily undermined by economic shocks, whether local or global, such as recessionary shocks. This can be observed from the fluctuations in annual contribution to GDP between 2000 and 2008 from a high of 8% in 2001 to 0.5% in 2008. Investment in the sector is significant at over ZAR10 billion a year since 2001 reaching ZAR23 billion in 2008 (TIPS 2009b). The sector has not evolved consistently in terms of its online profile, though cinemas and increasing numbers of restaurants take online bookings; and the hotel and accommodation sector is very well represented online, offering the capacity for online reservations and payments

[9]The activity index, used in the National Science Indicators Database, Institute for Scientific Information, Philadelphia, gives an indication of a country's research effort in particular fields relative to the world average, with an activity index of 1 indicating equivalence between the research effort for the country and the world average.

across the full price range and for all provinces. Advertising for the sector is still more powerful in the print media, with more limited advertising available in the broadcast and online media.

The travel and tourism sector took a big knock with the global slump, with arrivals down from 9.9 million in 2009 to 8.0 million in 2010. However, the sector still generated income of ZAR101.3 billion in 2009 and ZAR189.4 billion in 2010 (7.9% of GDP), the increase being partly due to a boost from the international soccer world cup. An interesting feature of travel and tourism is that (in 2009) domestic tourism benefitted from 30.3 million trips by 15 million people, contributing ZAR22.4 billion to GDP (SA Tourism 2009). For both foreign and domestic tourists, mobile voice and Internet communications are important media for staying in touch with the home or work base and for making travel decisions, hence the travel and tourism sector drives revenue to the communications sector. Most tourist venues, including hotels, bed and breakfast accommodation, bars and many restaurants have special "hotel" pay-TV packages, which earns major revenues from this market.

The sector also drives innovation in services, for example, electronic location services such as *iFind*, where the subscriber sends an SMS to the *iFind* number and receives information about the location of particular venues. The domestic tourism campaign "Sho't Left" can be accessed at www.shotleft.co.za and is aimed primarily at the youth market. South Africa's public sector tourism agency specifically documents the objective to "enhance creativity and innovative practices" in its annual report and reports on the use of websites, international television and cinema and online global marketing to push the development of the sector. In 2009, 1,272 billion consumers visited South Africa's tourism websites and left 88 million online impressions (SA Tourism 2010, pp. 17 and 52), indicating strong adoption of electronic means of information access for the sector. The agency notes the value of e-marketing "International research shows the digital platform to be the preferred travel research method, regardless of language or location, and positioning South Africa online allows us to access this rich resource and drive travellers to our shores" (SA Tourism 2010, p. 64) and reports that website traffic grew 350% in 2009, following the agency's revitalised online presence directed at more than 230 countries and territories, its call centre and national tourism phone number for local and international mobile roaming access.

Government services include the large services sub-sectors of education, health, policing and local government services, as well as the much smaller sectors of trade and industry, environmental management, low-cost housing and the many administrative functions across departments. The South African government is generally a good user of computing infrastructure for administrative purposes. But it has been a poor user of electronic communications services for interaction with the public, largely due to the absence of guiding policy after 2001, limited initiatives at cross-governmental collaboration on building e-services and lack of a holistic innovation-based approach to e-governance (Abrahams 2009). The government sector is one where many new opportunities lie for e-development that is for the enhancement of government services and communications through the effective application of advanced digital infrastructure and technologies.

Small and medium enterprises (SMEs) operate primarily in the services sector, drawing revenue from wholesale and retail, travel and tourism and services to government and business. Small-scale tour operators, local craftspeople and people who use their homes as tourist accommodation, offering the "South African tourism experience", are a new cohort of mobile and Internet users and this is a market sector that will grow in the next decade, taking e-development into the low- and middle-low-income sectors of the economy through global marketing and communications.

By contrast, the communications sector contributed 5% to GDP. Between 2000 and 2008, investment in the sector grew by 14% per annum including backbone networks, mobile, broadband and pay TV. As revenue for the communications sector moves beyond voice traffic and becomes increasingly data driven, further investment is essential. However, growth is dependent on sectors such as financial services, wholesale and retail, hotels and restaurants and will fluctuate with development in these sectors. The communications sector also earns revenue on the continent. As Africa's GDP has "more than doubled" (Ryan 2011) over the decade 2000–2010, this has generated increased revenue flows to South African firms. For example, it is reported that mobile communications firm, MTN, generated USD1 billion in revenue in Nigeria alone (Ryan 2011), though much of this revenue may remain outside South Africa, flowing to investors, manufacturing suppliers and strengthening new markets.

Since households access electronic services, we need to look at the contribution of the information technology sector to household computing and Internet access. There has been at least a decade of household computer use, laying the foundation for volume firms such as Matrix Warehouse and Incredible Connection, selling computers and peripherals at prices affordable to most middle-income and some lower middle-income households. Low levels of household penetration of computers may begin to improve as large numbers of second-hand laptops come into the marketplace, though the second-hand market is underdeveloped as regards hardware sales and maintenance. More agile, cheaper devices such as netbooks and tablets are also likely to be attractive to the household market.

The electronic content industry is relatively small and still in the early stages of development. International broadcast content is generally supplied by commercial digital satellite television broadcaster DStv, whose subscribers are likely to have access to a far greater range of information on world politics, international disasters, movies, sports and general knowledge than viewers of channels on the SABC, the public broadcaster. The more prolific local producers of Internet content are the media, financial, retail, tourism and entertainment sectors, some provincial and all metropolitan governments. An area of content building that is only just getting going is that of online educational content, as computer access in schools has slowly become more widespread, offering limited pre-packaged content rather than creative, constantly-updated content over the Internet. The local TV, film and advertising sectors are based almost exclusively in Johannesburg and Cape Town, but the future of this sector as an electronic content generator and innovator is still relatively unexplored. Given the country's 11 official languages, including 9 indigenous languages,

there is opportunity for creative work in TV, advertising and educational content, but the relatively small audiences for the majority of local languages means that limited content is produced other than in IsiZulu, IsiXhosa, Sesotho, Afrikaans or English.[10]

ICT Human Resources and Skills

The total ICT workforce, comprised of ICT core workers (developers, designers, practitioners) and ICT end-users (using ICT for work purposes across all economic sectors) has been estimated to be in excess of one million people for most of the decade to 2010. As regards core workers, the majority of ICT practitioners (60%) are employed in the IT sector, with the other major employment sectors being financial services, government, education and training, and the manufacturing/engineering sector (Schofield 2009, p. 7). As regards ICT end-users, the largest proportion of workers is in the community services sector, in financial and business services, manufacturing, as well as wholesale and retail trade (Akoojee et al. 2007, p. 20). A gender-based analysis of the ICT workforce was most recently undertaken in 2005 (James et al. 2006) and revealed that 64.4% of the total workforce were women, though men dominated the core workers component and women the end-users component.

These figures show the distribution of the ICT workforce to be predominantly in the broad services sector, ensuring business continuity. South Africa has no effective foothold in the global markets for ICT manufacturing, though a few companies, like UEC, produce digital satellite decoders for markets in the Far East and on the African continent. The broadcast industry has a relatively high level of creative and technical skills available to the local TV content industry, which produces local drama, commercials, news and some limited, yet excellent documentary work (Ngcobo 2010). While facilitation for international crews working on films and commercials is fairly well established, this is still a nascent industry, not yet engaged in large or long-term cultural content projects.

The size and capacities of the existing ICT workforce makes it an important foundation for e-development. Fifteen years ago, South Africa had virtually no skills base in mobile communications, in advanced computing, in managing technological and services convergence, now telecoms and IT companies employ a significantly wider range of skills than in the previous decade. However, the main message emerging from a series of reports on ICT human resources is that this is an area of national skills shortage, where several tens of thousands of core ICT practitioners with adequate training and education are needed (James et al. 2006; Akoojee et al. 2007; Schofield 2008, 2009) on an annual basis. In a recent skills survey of IT firms,

[10] Additional languages include IsiNdebele, Sesotho sa Leboa, Setswana, siSwati, Tshivenda and Xitsonga.

75% of respondents maintained that the skills shortage is detrimental to business operations, while particular respondents raised concerns about limitations to business viability, business efficiency, global competitiveness and impact on economic growth (Schofield 2009, p. 6). The banking and financial services sector is regarded as a thriving sector with high demand for IT skills, but shortages are experienced in the areas of software project management, systems integration and architecture, information security, database administration and other high level skills at the top of the skills pyramid for large-scale IT projects (Dwolatsky 2010).

In a 2010 SME survey conducted in Gauteng province, a large proportion of end-users, between 50 and 60% of respondents, reported that they had no confidence or lacked confidence in conducting everyday tasks such as installing computer software, using email, participating in online discussions, making calls over the Internet, using search engines and electronic record keeping. Between 20 and 40% of respondents said that they were either confident or very confident (Abrahams and Burke 2010).

While no in-depth review of ICT skills exists with respect to the knowledge base and capacities of core workers or end-users, the studies quoted here offer an insight into the general trends, strengths and weakness of human resources for e-development. The 2007 review of "ICT skills at the intermediate level" (Akoojee et al. 2007, p. 22) estimates that the majority of the ICT workforce, or nearly 70%, had further education (non-degree) qualifications, while less than a quarter of the workforce had higher education qualifications. The absence of effective maths and science education or curriculum advancement in foundation subjects for computer science, electronics engineering and computer-user skills at school level creates barriers to increasing the supply of young people to meet demand for skills in the economy.

Key institutions concerned with ICT skills development include the Department of Communications, the Department of Basic Education, the MICT SETA,[11] The Computer Society of South Africa (CSSA) and the Joburg Centre for Software Engineering (JCSE). Each of these institutions plays a specific role in the human resources landscape: the Department of Communications hosted a national skills summit in 2010 aimed largely at fostering greater investment in skills development in the IT sector, while the MICT SETA is a counterpart institution engaged in promoting the design, implementation and financing of workplace skills plans for the better part of the last decade.

The Department of Basic Education and the provincial departments of education are co-responsible for creating future generations of secondary education graduates with a combination of skills required either to enter the ICT workforce or to be advanced ICT users in business and society. School-level education programmes have been critiqued as being narrowly targeted to the final 3 years of schooling rather than taking a life-cycle approach, spread across government departments but not well co-ordinated (James et al. 2006, p. 30), or lacking reliable Internet connectivity

[11] MICT SETA = Media, Information and Communications Technology Sector Education and Training Authority.

and effective governance (SAIDE 2010). It has been argued that "One of the key challenges is the availability of skills, competencies and financial resources at the provincial level to launch initiatives with the regularity and on a scale where they will make significant impact" (James et al. 2006, p. 30).

Organisations like the CSSA and the JCSE are interested in the professional development of the electrical and information engineering and software sectors. The JCSE was established in 2005 with seed funding from the metropolitan government, the City of Johannesburg, that saw economic potential in supporting a home-grown software sector. Now largely supported by industry funding, the JCSE offers advanced post-graduate training programmes, but the current level of software development capacity is a barrier that will require strategic decisions at industry level to foster globally competitive software development (or not). Discontinuities in the human resource development pipeline for ICT core skills training occur at the end of secondary schooling, and again at the end of undergraduate study, since a very small proportion of the student population selects post-graduate study in computer science, software programming or electrical and information engineering.

e-Society: Persistent Digital Divide

South African media reaches a market of approximately 31.5 million people including the print and electronic media (OMD 2010). According to the AMPS[12] rolling 12-month survey statistics reported by OMD, 47% of all adults were reached by any AMPS newspaper, 47% by any AMPS magazine, 90% by radio and 85% by TV (last 7 days prior to survey), 11% by Internet (last 4 weeks prior to survey) and 85% by outdoor billboard advertising. As elsewhere in the world, South Africa has witnessed the integration of electronic communications with the services sector in those services that facilitate economic activity—banking and finance, commerce, trade and travel services. These services enable economic activity in manufacturing, construction, mining and agriculture, all of which rely on communications. This rise in electronic business communications in the major cities has raised awareness of its value among the general population, through the demonstrated economic efficiency of transactions and the myriad of engagements and interactions that voice and Internet offer. Households are thus becoming increasingly attracted to and engaged in online activity for economic interactions and for social networking, as many firms market their e-services. Since 2008, interest has swung to mobile voice and mobile Internet, as mobile broadband provides a better connectivity solution for highly mobile workers in the services sector, in the academic and research sector and amongst the managerial echelon in the public and private sectors.

[12] AMPS = All Media and Products Survey conducted by the South African Advertising Research Foundation.

However, digital inclusion and exclusion operate side-by-side negatively affecting e-development. While more firms and households go online each day, only 20% of the population will be online by 2014 and it is estimated that it will take until 2020 for 50% of the population to be online (Goldstuck 2010, p. 8). Aiming for universal access will require a greater than 15% increase in Internet penetration for every year during the next decade, in order to reach 50% Internet access and usage at the end of that decade. For this to happen, major policy and regulatory changes will be required as the mobile and Internet markets are not currently providing a sufficient stimulus for such growth. The majority of firms (which are small or micro) and the majority of households (which are large and low-income) experience numerous obstacles to digital access. They lack the income, assets, access to communications infrastructure and/or availability of content in services in local languages needed to take advantage of the digital revolution. In some cases they also do not believe in any potential value to be gained.

In Gauteng province, which has the largest population and the largest economy, mobile networks are extensive and broadband networks are on the rise, creating the infrastructure necessary for Internet-based business and social interaction. Gauteng exhibits high levels of ICT usage, since it has a high concentration of business as well as government administration given to the presence of national and provincial government and three metropolitan municipalities. The province also hosts six universities and a large number of the country's science performing agencies, all of which are power users of ICT. Gauteng is highly urbanised, while all other provinces have large rural populations. No other province comes close in its level of communications infrastructure development, as the density of lines is strongly related to population density and urbanisation.

Gauteng has an estimated population of 10.4 million living in an estimated 3.1 million households. While unemployment is high at around 30% of the population, the penetration of mobile telecommunications in 2010 is greater than the 80.3% of households recorded in 2007 (Table 4.1), reaching 94.9% of households according to a 2010 survey (Abrahams and Burke 2010). The survey shows a faster rate of mobile telephony adoption (an increase of nearly 15% in 3 years) as compared to Internet adoption (an increase of less than 2% in 3 years). Another divergent trend is household Internet access between metro and non-metro areas. The 2007 figures show that Internet adoption in the non-metro areas is only half that of the metro areas. While the 2010 survey did not test this specifically, it found that Internet access in non-metro local municipalities was exceptionally low, such as is the case in Westonaria, historically a service town to the mines, the economy of which has become eroded as nearby mines closed. While the gap between household mobile and Internet access for Gauteng and for the rest of South Africa does not appear large, it is noted that the data for South Africa is reflective of the higher access for Gauteng and the other three metro areas—Cape Town, eThekwini Metro (with Durban as the main city) and Nelson Mandela Metro (Port Elizabeth is the main city). More detailed statistics (StatsSA 2007b; Comninos et al. 2010) reveals that household mobile and Internet access in rural towns and environs has remained low throughout the last decade.

Table 4.1 Proportion of households with a mobile phone and access to Internet facilities by municipality, Gauteng and South Africa 2007 and 2010

	2007			2007		2010	
Gauteng municipalities: district, local and metro	**Households: mobile phone**	**Households: Internet access**	**Total households**	**Percentage households: mobile phone**	**Percentage households: Internet access**	**Percentage households: mobile phone**	**Percentage households: Internet access**
Sedibeng District	175,834	13,212	241,223	72.9	5.5	Municipal level data not yet publicly available	Municipal level data not yet publicly available
Emfuleni Local	143,139	8,586	196,480	72.9	4.4		
Midvaal Local	18,049	2,306	24,265	74.4	9.5		
Lesedi Local	14,706	2,320	20,479	71.8	11.3		
Metsweding District	38,222	3,120	46,502	82.2	6.7		
Nokeng tsa Taemane	12,196	930	14,838	82.2	6.3		
Local	26,025	2,190	31,665	82.2	6.9		
Kungwini Local							
West Rand District	137,528	13,468	186,850	73.6	7.2		
Mogale City Local	71,462	9,797	94,288	75.8	10.4		
Randfontein Local	30,234	2,111	40,459	74.7	5.2		
Westonaria Local	34,766	1,444	50,675	68.6	2.8		
West Rand District	1,065	116	1,429	74.5	8.1		
Ekurhuleni Metro	675,350	89,170	849,349	79.5	10.5		
Johannesburg Metro	950,768	165,989	1,165,014	81.6	14.2		
Tshwane Metro	571,920	88,048	686,640	83.3	12.8		
Gauteng	**2,549,681**	**373,007**	**3,179,579**	**80.3**	**11.7**	**92.8**	**17.1**
South Africa	**9,090,231**	**900,612**	**12,500,609**	**72.7**	**7.2**	**88.0**	**10.1**

Source: Derived from StatsSA (2007a) Tables GP12 and GP15 and StatsSA (2010c), Figures 27 and 28

While mobile penetration is generally high, it is estimated that there are still an exceedingly large number of rural municipalities with mobile penetration below 70% of households (Table 4.2). As regards Internet access at home, six provinces have lower than 8% access. Only in provinces with metropolitan municipalities, where the population exceeds a million people, namely in Gauteng, Western Cape and KwaZulu-Natal, does Internet access at home approach or exceed 10% of households. While household Internet penetration has increased since 2007 and is estimated at approximately six million users for 2010 including business and academic users (Goldstuck 2010, p. 137), the relatively slow rate of increase in household Internet access in Gauteng, an estimated 6% over 3 years (StatsSA 2010c), is a predictor of a similarly slow rate of increase in the rest of the country.

Table 4.2 elaborates the proportion of provincial households with mobile voice and Internet communications, and for each province, the local municipality with the lowest proportion of mobile voice or Internet communications, or both. This data reflects the gap with respect to universal service at the household level that has to be addressed through a combination of market and regulatory mechanisms. The purpose of addressing this gap is not merely to create digital access, but to create a strong country-wide foundation for the effective economic integration of households into the productive and distributive economies, through e-development. On the productive side, communications technologies and electronic services can position households to engage in forms of economic activity not possible without them, such as trading from home. On the distributive side, they can position households to gain specific benefits, such as accessing services from home.

The adoption curve for mobile voice communications shows a relatively rapid increase in the 6-year window between the 2001 Census and the 2007 Community Survey, with a national increase in household penetration of 40%, more than double 2001 levels. Internet penetration levels appear to be advancing more slowly, presumably due to a combination of the higher cost of equipment, of regular access and services, and lower levels of infrastructure availability outside the metro areas. Many of the most marginalised local municipalities have more than 10,000 households, see Table 4.2.

It is unsurprising that advanced telecoms networks were installed first in the three metropolitan areas of Johannesburg, Tshwane and Ekurhuleni. What is surprising is that access is quite so low in a country needing communications and other infrastructure to pull itself out of its historical economic slump. In the Eastern Cape in 2007, a province with a population of 6.5 million, 14 local municipalities had less than 1% household Internet penetration, while in KwaZulu-Natal, a province with 10.2 million people, 13 local municipalities had less than 1% household Internet penetration. This data reveals some of the characteristics of the digital divide in South Africa, where middle- and high-income households will have the necessary resources to access electronic services and educational content, thus boosting their economic capacities, while for the vast majority of households, the current and next generation of the economically active population will remain excluded from electronically mediated economic activity. Mobile broadband adoption is increasing rapidly in the

Table 4.2 Proportion of households with a mobile phone and household Internet access by province, 2007 and 2010

	2007					2010	
Provinces (population)	Households: mobile phone	Households: Internet access	Total households	Percentage households: mobile phone	Percentage households: Internet access	Percentage households: mobile phone	Percentage households: Internet access
Eastern Cape (6.5 m)	971,310	50,422	1,586,735	61.2	3.2	79.9	3.8
Ikhwezi Local	1,144	83	2,567	44.6	3.2		
Free State (2.7 m)	548,090	32,975	802,872	68.3	4.1	85.1	6.9
Mohokare Local	5,530	121	10,216	54.1	1.2		
Gauteng (10.4 m)	2,549,681	373,007	3,179,579	80.3	11.7	92.8	17.1
Westonaria Local	34,766	1,444	50,675	68.6	2.8		
KwaZulu-Natal (10.2 m)	1,606,906	123,921	2,234,129	71.9	5.5	88.5	8.0
Ndwedwe Local	12,656	202	26,408	47.9	0.8		
Limpopo (5.2 m)	856,869	21,345	1,215,935	70.5	1.8	90.2	3.1
Fetakgomo Local	13,322	237	21,851	61.0	1.1		
Mpumalanga (3.6 m)	728,132	35,148	940,403	77.4	3.7	92.3	6.3
Seme Local	13,820	968	21,605	64.0	4.5		
Northern Cape (1.0 m)	163,558	14,315	264,653	61.8	5.4	75.6	6.0
Karoo Hoogland Local	1,105	216	2,982	37.1	7.2		
North West (3.2 m)	646,156	26,479	911,120	70.9	2.9	86.4	6.0
Maquassi Hills Local	11,325	421	20,330	55.7	2.1		
Western Cape (4.5 m)	10,191,530	223,001	1,369,180	74.5	16.3	85.4	18.7
Laingsburg Local	819	144	1,966	41.7	7.3		

Source: StatsSA (2007b), compiled from basic results for all provinces and StatsSA (2010c), Figures 27 and 28

cities. At relatively lower cost than fixed broadband,[13] it may unlock Internet access and usage outside the cities in a few years. But in the course of the past decade, the market has failed to bring widespread Internet connectivity to the home.

There has been much interest in public access centres such as telecentres, multi-purpose community centres and digital lounges, as regards their potential contribution to bridging the digital divide. During the late 1990s and into the 2000s, more than 500 such centres were launched in rural provinces, many by the Universal Service Agency and by institutions such as the Council for Scientific and Industrial Research (CSIR). In addition, the Government Communications and Information System (GCIS) promoted multi-purpose community centres (MPCCs) in urban and rural towns. While a few telecentres remain, they were poorly resourced from inception, both in terms of telecommunications and Internet connectivity, as well as the organisational and entrepreneurial capacities required to make them function effectively. In addition the slow pace of emergence of e-government services and e-education applications on one hand, and the general lack of small-scale business solutions for SMEs or informal sector businesses on the other have resulted in the failure of the original telecentres and MPCCs to attract audiences or to be sustainable.

Public access initiatives that have achieved greater success are those based in some of the country's more than 1,200 public libraries, many of these library Internet access points based in poor communities in the City of Cape Town and in the rural areas of the Western Cape, or the digital lounges established in Gauteng in the late 2000s. These initiatives by provincial and metropolitan governments, often working with non-governmental organisations, represent only a very small contribution to addressing the digital divide, as discussed further below.

e-Society: ICT Usage, Online Media and Social Networking

Table 4.3 shows the make-up of the Internet user population—those who use the Internet on a regular basis for commercial and social transactions, but excludes users whose main form of access is through Internet cafés, municipal libraries or other public facilities. Broadband usage far exceeds low-bandwidth dial-up usage, possibly because most services require high-speed bandwidth. More households use wireless than fixed-line ADSL access and many subscribers use wireless as a secondary form of access away from the workplace. This emphasises the mobility requirements of many Internet users, whether mobility is based on increasing telecommuting, or greater mobility due to working in the services sector, or being mobile for social purposes such as being connected during periods of holiday travel. However, SMEs still predominantly use ADSL access.

Users accessing the Internet through public access points will typically represent a lower volume of Internet usage, but there is little data available regarding who

[13] The cost of a 3G card is lower than the cost of an ADSL connection, while mobile broadband can be bought in smaller units than ADSL.

Table 4.3 Internet subscribers and users

Total wireless b/b subscribers	Unique wireless b/b users	ADSL b/b users	Total broadband users	Dial-up Internet users	Corporate users (mainly leased lines)	SME users (additional, mainly ADSL)	Academic users	Total Internet user population
1,494,000	930,000	630,000	1,560,000	250,000	2,060,000	506,000	540,000	5,300,000

Source: Goldstuck (2010, pp. 75–137)

these users are, for what purpose they use the Internet, what they spend on Internet access or how long their Internet sessions last. A tour of public access points in municipal libraries in two rural towns in the Western Cape (Genadendal, a historic mission station, now with only limited tourism and Struisbaai, a fishing town where many jobs have been lost due to the decline of the fishing industry) sheds some light on public use. In Genadendal, the main users are school-children researching educational projects, while in Struisbaai a local organiser translates information from the website http://Windfinder.com from English into Afrikaans, advising the fishing community of the best times to go out to sea. http://Windfinder.com offers up-to-date information on predicted wind speeds and wind gusts, as well as wave direction, wave height, cloud cover and rainfall for various times of the day and is thus a valuable information resource, assisting the fisherfolk in day-to-day decision-making and limiting the wastage of scarce economic resources. Here, Internet access is communal rather than individual, though young children who use the service exhibit individual needs and interests.

Consumer surveys of Internet usage in South Africa (Nielsen 2009) show a marked increase in the number of unique browsers, the number of page impressions, the number of sessions, time spent and average time per user. The greatest increase between 2007 and 2008 was the increase in the total number of hours consumers spent online. Though there are no available consumer surveys for 2010, it is almost certain that these indicators are increasing if the increase in broadband subscription and usage is considered. Nielsen (2008) studies present a basic view of consumer activity, illustrating that increasing numbers of South Africans are going online to find jobs, to view news and sport and to trade in the real estate and automotive sectors. Goldstuck (2010) classifies six kinds of mobile users, which can be organised in four clusters:

(a) Young, low-income users, where income is a key factor in limited mobile usage (grassroots).
(b) Older, middle-income users, where e-services adoption is lower than expected considering income and may be largely attitudinal (ostriches and elephants).
(c) Young, middle-income users, where e-services adoption is good and likely to increase with age and income (magpies and lion cubs).
(d) Users across the age spectrum, where income and attitude are key factors in greater mobile usage (sophisticats).

South Africa's mobile consumer has banking as a high priority (see Fig. 4.4), with 34% of banking customers using either the mobile phone, the Internet, or both to conduct banking transactions. In order to ensure security of transactions, banks offer instantaneous SMS and email notifications for all credit card and Internet transactions, providing the capacity for immediate validation and query (Table 4.4).

The tourism and hospitality sector exhibits significant mobile and Internet usage, with tourists being perhaps the most supremely mobile population, accessing both fixed and mobile networks. In 2010 alone, South Africa had more than eight million tourists (SA Tourism 2011) contributing an estimated 7.9% or ZAR189.4 billion to GDP (SA Tourism 2010) of which a small proportion of tourism spend would go to mobile and Internet communications, both from the visitor's purse and

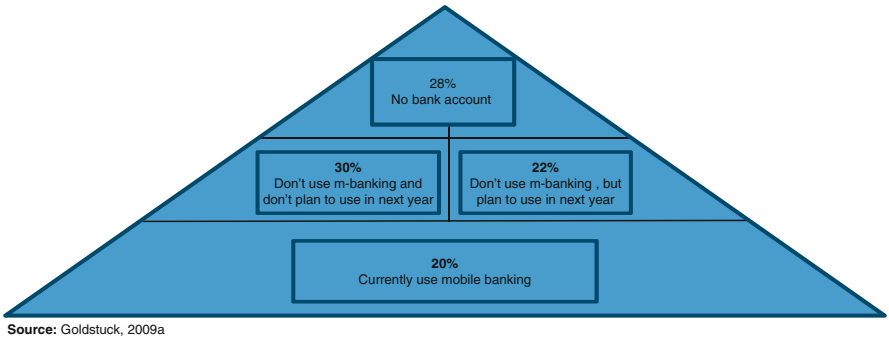

Fig. 4.4 Online banking in South Africa, 2009. *Source*: Goldstuck (2009a)

from the tourism and hospitality sector, not including the roaming costs. The majority of tourists or 5.7 million people were from countries on the African continent (SA Tourism 2011), reflecting the mobile continental population who travel to South Africa to study, to visit with families or to buy goods for micro and small businesses and who therefore do not seek business visas.

Social networking sites such as Facebook and Twitter gained popularity in 2009, with South Africa reported as among the top 30 countries by number of Facebook users (Hernandez et al. 2010, p. 5). In addition to individual users, non-governmental and community-based organisations are keen users of social media because of their confirmed role in strengthening democracy. The broadcast media are high-volume users of social networking media as distribution channels for their content, thus creating additional means to attract customers and to attract revenue through premium SMS. Business networking media such as LinkedIn and blogging are popular amongst communities of interest, in particular amongst academic institutions (Fig. 4.5).

Online media, social media and electronic commerce all add to the emerging reality of a services sector that is going mobile, potentially readying itself for a revolution in the way it does business. From the perspective of the annual ICT skills survey, Schofield (2010) arrives at a similar conclusion "What we can see from the data is the growing influence of social networks on the skills required in the ICT sector, combined with the increasing use of mobile devices as business tools". However, South Africa is not yet experiencing the "3G" revolution sweeping China, where a huge transition in mobile and Internet usage is occurring, based on the rise of the interactive content industry which is drawing attention to the new flexibilities and enhanced content capacities of next generation broadband networks and mobile content design (BuddeComm 2011). It may not be far behind the curve, if innovations such as the Mahala[14] Community Trading Platform (Seeber 2011) increase in number and value to particular user groups.

Unlike in many developing societies such as the Philippines, Egypt and other Arab countries, there is no specific series of events where ICT can be said to be

[14] "Mahala" is the Zulu word meaning "free".

Table 4.4 Trends in mobile and mobile Internet usage—South Africa

Classification	Age	Spend: average monthly income	Increasing level of sophistication in mobile usage	Percentage of market (%)
Grassroots (low usage)	16–35	ZAR ≤ 200 of ZAR1,723	60% of this group have bank accounts and 17% bank using the mobile phone; only 3% have Internet access on the mobile phone; main features used are typically calls or SMS, camera or diary/organiser	30
Ostriches (low usage)	36+	ZAR ≤ 200 of ZAR3,229	74% have bank accounts, 15% use mobile phone banking, but only 3% have mobile phone Internet access; use on average one feature	18
Elephants (low usage)	25+	ZAR201+ of ZAR4,598	84% have bank accounts, but only 19% use mobile phone banking and only 12% have mobile phone Internet access; use on average two features	10
Magpies (medium usage)	16–35	ZAR ≤ 200 of ZAR2,046	67% have bank accounts, 15% use mobile phone banking and 46% have mobile phone Internet access; use five or more features	23
Lion cubs (medium usage)	16–24	ZAR201+ of ZAR3,135	79% have bank accounts, 27% use mobile phone banking and 20% have mobile phone Internet access; use approximately three features	11
Sophisticats (high usage)	19–45	ZAR201+ of ZAR7,584	100% have bank accounts, 46% use mobile phone banking and 65% have mobile phone Internet access; use on average seven features	9

Source: Goldstuck (2009a)

enabling the democratisation of South African society and social change. In the 2011 municipal elections, the two major political parties, the ANC and the DA[15] used social media extensively to communicate with voters and the election conversation also took place on news websites, blogs and web forums (Memeburn 2011). There are many NGOs using the Internet to promote democracy and human rights, though their reach is mainly in the metropolitan centres, including organisations such as Women'sNet, SANGONeT and others.

> Women'sNet is a feminist organisation that works to advance gender equality and justice in South Africa using Information and Communication Technologies (ICTs). They offer training and facilitate content dissemination and creation that supports women, girls, and related gender organisations and networks to take control of their own content and ICT use. The website (www.womensnet.org.sa) is a hub for information by women, about women and gender, and has a focus on South African and African content. They help women to find the people, issues, resources and tools they need for social activism (Akinsanmi 2010, p 20).

Since 1994, South Africa's media have increasingly become the public space for democratic debate, as the numbers of non-governmental and community-based organisations declined, largely due to the shift of international funding from NGOs and CBOs to government. Although the community-based sector has revived, it has not attained the same size and power that it enjoyed during the challenge for democracy. The most vocal and influential organisations have been the trade unions, such as COSATU, pushing for increased wages, against the government's support for undemocratic regimes such as Zimbabwe and against corruption in the public sector; and those in the health sector, challenging government's stance on HIV/AIDS. It is largely through the print and broadcast media that these views and positions are expressed, noting that the media have a significant electronic presence. However, the point is that at this stage of development, there is limited material in the sphere of socio-political advocacy that is digital.

The most notable example of demand-driven governance in recent years has been the service delivery protests in urban townships and in small, rural towns fighting the failures of local government to provide basic services such as water, sanitation and a clean environment. These protests have, in the most part, been conducted in the streets rather than online. Despite the expressed intention of government to create electronic communications platforms for consultation on 5-year municipal development plans (IDPs), there are few, if any, local governments where decision-makers and citizens are engaged in online communications with respect to government accountability and citizen participation in governance.

Electronic Business, Electronic Commerce

Electronic business and commerce are most visible in the services sector—in banking and financial services, tourism and entertainment, and in academia. The trend towards

[15] ANC is the African National Congress and DA is the Democratic Alliance.

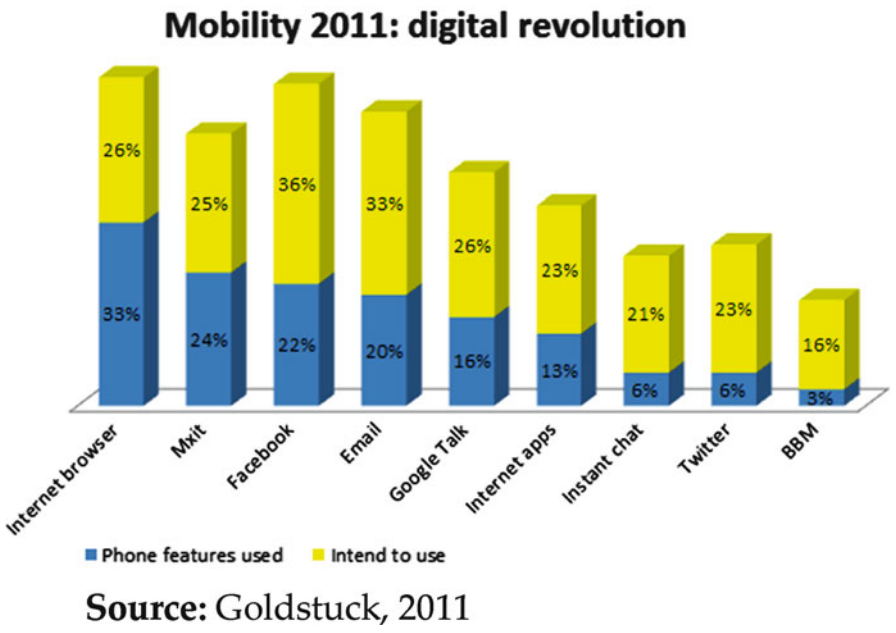

Fig. 4.5 Mobility survey 2011: mobile usage and intended usage. *Source*: Goldstuck (2011)

e-business can be observed, inter alia, from the increased data usage and revenue reported by telecoms firms. The 2010 Internet survey (Goldstuck 2010, pp. 120–123) reported that there were more than two million corporate users in 2009. Telkom, the dominant player in the data services market, reported multi-billion rand revenue of ZAR10.6 billion for the year ending 31 March 2011, though this was not increasing as rapidly as may have been expected. The most notable finding of the survey was that corporate users were experiencing improved Internet access, i.e. better performance due to higher bandwidth. There are few studies examining electronic business across the range of industry sectors. Thus, while analysis of the limited available data suggests that electronic business is gaining ground in the services sector including banking and advertising and has been slow to form in the manufacturing sector, sector studies are needed to provide greater insight into the trends occurring here.

There were 4.6 million South Africans banking online at the end of 2009 (Goldstuck et al. 2010) and an estimated five million in 2010. Low-cost banks such as Wizzit, a division of the South African Bank of Athens Limited, and Capitec are taking up the slack in the unbanked market, though this requires new business models and non-traditional partnerships with retailers in order to get close to the customer. These are green-field innovative ventures which can bring the prospects of e-development within reach of the low-income consumer.

> The tipping point appears to have been reached. (Banking and telecoms) Regulators have defined their legislative structure; cellphone operators have come to terms with operating in

the stricter banking environment; consumers have learnt to trust transactions by phone; and banks are devising business models to make money from this service (Claasen 2010).

In the small- and medium-sized sector, SMEs are predominantly ADSL users, with 73% of firms surveyed using ADSL as compared to only 8% using wireless broadband (Goldstuck 2010, p. 79), possibly due to greater reliability and quality of throughput. A further 30% of SMEs use wireless broadband as a back-up form of access. This may also be an indication that more SMEs operate from fixed premises, as the 2009 SME and entrepreneurship survey (Kew and Herrington 2009) suggests. However, it will be interesting to examine future trends in SME broadband adoption and analyse whether mobile substitution will occur as economic evolution takes place in the SME sector. The top five services for ADSL usage are legal services IT software, employment services, hotels and communications, ranging from 100 to 85% ADSL usage, though ADSL penetration is at least 75% across the top 14 services including financial services and manufacturing. ADSL penetration in the SME sector is greatest in wholesale, construction, agriculture and mining, but relatively low amongst those SMEs that service the government and education sectors (Goldstuck 2010, pp. 80–81).

It has been estimated that there are approximately 2.4 million SMEs in South Africa. Of these, approximately 487,125 use the Internet and each small business that gets connected adds between 1 and 20 additional users to the population of Internet users, effectively adding 756,000 users to the Internet user population according to the latest available figures. An important perspective on the SME sector, gained from research on the Gauteng province, is that between 53 and 63% of SMEs in BSM[16] categories 3–6 are doing business from home (African Response 2006), using ICT including switchboards, email, Internet, websites and in some instances a small network. While usage was generally low, it was highest in the services sector and next highest in the sale of goods. An SME and entrepreneurship survey (Kew and Herrington 2009) argues that the nature of ICT usage in SMEs is relatively basic and recommends the greater availability of customised small business solutions to enhance the value of connectivity.

e-Commerce is relatively widespread, with services offered by ticketing websites like http://Strictlytickets.com, online booking options for movies, and the presence of point-of-sale devices in both urban and rural areas enabling electronic transactions at restaurants, automotive service centres and most retail outlets. The mini-automatic teller machine (ATM), a South African innovation, uses the banking network to enable cash withdrawals at retail outlets, where the customer can exchange an ATM receipt for cash and the retailer is reimbursed by the relevant bank, distinct from the "cashback" models in the UK and Europe which use the point-of-sale devices. This mini-ATM is popular in rural areas, because it reduces the cost to banks of transferring large amounts of cash by road and reduces the banking costs of the retailer.

[16] Business Sophistication Measure: The market research presents seven BSM categories, of which BSM 1 is largely informal, BSM 7 is the most formalised of SMEs and BSM categories 3–6 present increasing levels of formality.

Electronic Government

The services components of government that have the greatest interface with the public are health, education, policing and social development. Hence, these departments are the top candidates for advances in electronic services. However, there has been only limited application of ICT in these services segments, mainly to render back-office administration more efficient, but the electronic interface with the public has not been established and hence the facilities required for e-development in these services sectors have not been fostered. National health information is still managed as it was in 1995—paper-based rather than electronic (van den Heever 2011)—and other services departments have not emulated the services sector trend of using ICT to advance the quality of services information and transactions with customers.

The citizens' information portal Batho Pele[17] Gateway available at www.gov.za, electronic filing of tax returns and the Government Employees Medical System are a few of the more successful applications of electronic government at national level. However, the successful systems tend to focus on e-administration and government ICT applications have had limited impact in terms of creating a rapid evolution of the public services sector.

At the provincial level, the Gauteng and Western Cape governments have focused on a few large-scale programmes (see Table 4.5).

The website for GautengOnline Schools provides links to other sites hosting educational material, but the project has not yet evolved to become a full-scale e-learning programme using a combination of phone and computer-based technologies. By 2010, there were as yet no online textbooks or other supporting learner materials. Anecdotal evidence from a variety of sources indicates that the centralised content management system is not attractive to teachers and schools as it places quite severe constraints on how the computer may be used as a learning tool. By contrast, the emergency medical services and police operations centre show effective use of ICT towards e-development in these particular service fields.

Low levels of Internet penetration into households and small businesses have a negative effect on the push and pull for innovations in digital public services. This may partly explain the absence of electronic government services in the remaining seven provincial governments. At local government level, metropolitan municipalities such as the City of Joburg and the City of Cape Town have a well-developed web presence, which is likely to contribute to stimulating ICT usage amongst middle- and high-income households. Poor communities have very limited Internet access through projects such as SmartCape (www.smartcape.org.za), a public access and content service available at community libraries across Cape Town.

Raising the levels of accessibility and availability of e-services, in the Western Cape and other provinces, to the levels required to meet communities' information and services needs will require long-term commitment, as well as government and

[17] People First.

Table 4.5 Selected e-government projects in two provinces

Province	Project	Purpose	Level of success
Gauteng	GautengOnline Schools	To utilise ICT in support of learning	Computers in approx. 1,100 schools, but limited access to educational content—a centralised system where material is made available from a central source, hence poorly utilised in schools
	Gauteng Emergency Medical Services	To ensure rapid response in dealing with disasters and medical emergencies	Enables effective dispatch and tracking of emergency vehicles, as well as management of emergency services across municipal boundaries
	SAPS (South African Police Services) Gauteng Operations Centre	To manage citizen calls and dispatch policing services	Digital information management system enables easy processing of high data volumes. Availability of crime intelligence for decision-making and rapid response
Western Cape	Cape > gateway	To provide "easy access to government information and services" (http://www.capegateway.gov.za/)	Access to a wide range of information on services from agribusiness to disaster relief and special needs transport
	Edumedia Online	Online educational resource repository	Fair access to a wide range of learning materials which can be accessed either from school or another location

Sources: Abrahams (2009) and Abrahams and Reid (2008)

industry funding. It will also require a greater pressure on government to innovate, for example, through offering mobile content and services for the large numbers of the population who are mobile between the cities, smaller towns and rural settlements, thus augmenting communications with health audiences, schools and communities. Creating ICT service platforms in health and social security can enable government to consider services innovations and even policy innovations that are not possible without the heightened information and knowledge management capability that electronic information systems bring. For example, the analytical capability of decision-support tools can enable provincial and local government to do better targeting of specific services towards highly segmented public audiences, as compared to the historically more generic provision of the same services to all. Such a change would constitute a services revolution in the public service sector.

Leadership for e-Development: Policy and Regulatory Environment and Institutions

The first policy framework on telecoms and the role of ICT in development was the Reconstruction and Development Programme (RDP) of the African National Congress, published in 1994 before the ANC became the ruling party in government. The document was elegant and the product of a consultative process with civil society and industry. The RDP heralded the inauguration of democratic governance and was seen as the basis for a coalition of interests. The framework made key statements on the economy, including that "Telecommunications is an information infrastructure and must play a crucial role in South Africa's health, education, agricultural, informal sector, policing and safety programmes…The telecommunications sector is an indispensable backbone for the development of other socio-economic sectors" (ANC 1994, p. 34). The framework included references to universal affordable access to telecommunications; to developing a modern telecommunications and IT system; and to the formation of a strong telecoms manufacturing sector. It also made some poor judgements against liberalising the telecoms market, arguing that "the basic infrastructural network must remain within the public sector" (ANC 1994, p. 109). An RDP ministry was established in the Presidency, as a co-ordinating ministry. Soon after its establishment, as ministers settled into their respective posts and duties, the RDP ministry came to be seen as an unwelcome super-ministry and it was closed down.

In this early setting, two of the smallest ministries were the Ministry of Communications and the Ministry of Science and Technology, both crucial to foster a radical new economic formation, not merely post-apartheid, but for late twentieth century global competitiveness. The ministries were comparatively weak, given meagre budgets in relation to their challenging mandates. In particular, the Ministry of Communications made its first errors with respect to its failure to introduce competition in the fixed-line market. The incumbent fixed-line operator, Telkom, was granted an extended period as a monopoly provider, which by a variety of means, including

ministerial delay and error, meant that it was the only player in the fixed-line telecoms market until late in 2007 when Neotel commenced operations. Moreover, the introduction of this second fixed network operator has brought only limited change and little effective competition in either the business or household markets, being seen as "an ineffectual competitor to Telkom" (Guest 2011, p. 34). Some limited price change is looming in the sector, as a result of regulation rather than competition, as the 2010 call termination regulations, which set down significant reductions in fixed and mobile call termination rates over 3 years, took effect in March 2011.

Many erratic policy positions followed, inter alia the creation of an effective monopoly in the fixed-line market, a duopoly in the mobile market, policy failure in universal access and service and late focus on broadband. The policy-maker has pursued a position against introduction of full competition in the telecoms market over an extensive period—1996 to date. Universal access policy has been an unremitting failure, with so little movement that the need for universality in fixed-line access has been made irrelevant by effective mobile substitution in the voice market and the requirement for broadband as the basis for accessing electronic services. Lewis (2010, p. 2) argues that "The country has now arguably achieved universal access … in respect of mobile voice telephony—despite, rather than because of, sector policy". The Universal Service and Access Agency (USAASA) was established as a distinct policy advisory and regulatory agency to foster universal access, however, it failed in at least two respects. It focused on establishing telecentres, rather than on research-based policy advice to government. Despite being a small agency, it took on the mammoth task of creating other institutions to bridge the digital divide. This often involved investment in bricks and mortar, putting in the infrastructure and services and creating the institutional environment for community use of the telecentres. Despite being able to use the Universal Service Fund, effectively a tax on consumers and business users, for this purpose, the role of institution and capacity-building to advance the progression of telecentres over time could not possibly have been played by a single, small public sector agency.

Furthermore, the responsibility to provide explicit written policy advice to government on key issues in universal service, for example, the definition of needy persons or the attributes of universal service, was not seen by USAASA's leadership as a pivotal role. Unlike many other policy advisory bodies in the broader science and technology and innovation space, that put their budgets and decision-making processes into high-gear bringing new policy ideas into being, the USAASA delivered almost no written policy advice in its entire term spanning more than 10 years. The absence of any serious research programme, despite the requirements for this in the Telecommunications Act 1996, meant that USAASA was not alert to the trends and shifts occurring in e-development and therefore did not adapt their thinking from universal fixed-line access to mobile access to broadband Internet access for communities.

Perhaps a singular focus that the USAASA should be credited with is that it has been the only agency to put its resources into rural communities. The Ministry of Communications encouraged a policy of under-serviced area licencees (USALs) and licences were duly awarded to USALs in circa 2004/2005, but these licencees

never gathered the financial capital or other capacities required to take infrastructure to rural under-served communities, nor was it possible to construct a viable business model for effective infrastructure and services provision. Thus, the USAL approach failed.

A more effective aspect of policy and regulation was the provision for universal service obligations (USOs) contained in the telecommunications licences awarded to fixed and mobile operators. These USOs included obligations to introduce access lines, specified geographical coverage and required provision of 120,000 public payphones (Telkom), 81,500 community service telephones (mobile operators) and high-speed internet connectivity to 2,500 public schools and 2,500 public clinics (Neotel) (Lewis 2010, p. 5). It cannot be verified whether these obligations were implemented in full, as there has been no apparent regulatory enforcement or regulatory audit. However, the push from mobile operators through the innovation of very low-cost pre-paid mobile voice access, in combination with the physical availability of community service telephones, which are telephones at a fixed location that operate using the wireless networks of mobile operators, gave mobile telecommunications a particularly high and attractive profile over fixed access. This led to high levels of access (60% or more) when viewed at the provincial level and higher levels of mobile as compared to fixed access in many poor, rural environments, as suggested in Table 4.2. The challenge for the future is to translate mobile telecoms access into effective usage that produces visible social and economic value for low-income users. This relates to the need for lower access prices and the stimulation of content development for this segment of the South African economy, a broad area for interrogation for possible ex-ante regulation.

As regards the evolution of the legislative framework for e-development, preparation for convergence in technologies, markets and services commenced in 2002 and the Electronic Communications Act replaced the Telecommunications Act in 2005. The e-commerce law (RSA 2002), the Electronic Communications and Transactions Act, legalised the digital signature and other key aspects of e-commerce practice. The Act required the Minister to present an e-strategy for adoption by Parliament, setting out an electronic transactions strategy, universal access strategy and promotion of e-commerce with respect to small, medium and micro-enterprise (SMME) amongst the measures to achieve the goals of being a competitive global player "to promote the Republic as a preferred provider and user of electronic transactions in the international market" (RSA 2002, s 5 (4)(c)). The law required collaboration amongst national government decision-makers in order to include an e-government component in the national e-strategy. This strategy did not emerge in the stated 3-year period, but the Information Society and Development Plan (ISAD Plan) was released in 2006, though this plan has not been gazetted as a national e-strategy.

In the decade to 2010, the landscape of electronic government policy has been bleak, consisting of three main policy documents—*Electronic Government: The Digital Future* (DPSA 2001), a 2003 White Paper on e-Education (DoE 2003) and the 2006 ISAD Plan (The PNC on ISAD c2006). The e-government policy adopted a technology, IT security and e-administration angle and did not express itself on the role of electronic media in improving public services through e-health or other

services applications. The e-education policy may have been satisfactory in print, but in practice e-education did not take off in any significant way, possibly because no budget plans were developed and hence no fiscal transfers to e-education could take place, noting that education is a provincial mandate. The ISAD Plan drew attention to e-health and e-education, but coming from one of the smallest government departments with no leverage, very little attention was paid to it by other national departments or provincial administrations. Subsequent to 2006, two initiatives were presented, but do not appear to have been implemented—the electronic provision of six pro-poor services including social grant applications and the "one-laptop per teacher" plan. While e-administration continues to make progress at the government-to-government level, this is largely the effect of computerisation of public administration, rather than electronic government.

The introduction of broadband policy in 2010 was perhaps 9 years behind the curve of broadband market development as the major players, including the metropolitan municipalities, had all long adopted their specific broadband strategies and a mobile broadband substitution effect may already be emerging. National policy is unlikely to change the direction of market developments in the near term, certainly not to the extent that it will see broadband infrastructure development in low-income areas. As a case in point, the establishment of the state-owned broadband entity, Broadband Infraco Limited, has not yet created substantial upward movement in public broadband access. Broadband Infraco was established by legislation in 2007 with the express intention of creating a state-owned enterprise that could meet the high-speed bandwidth needs of mega-projects such as the Square Kilometre Array radiotelescope bid (SKA). The risk of losing this international competitive bid could not be compromised by the high prices charged by the incumbent fixed-line operator. In addition, the legislation expressed its purpose as the expansion of broadband infrastructure to under-serviced areas. However, it will be phenomenally expensive to route this infrastructure beyond its current positioning as national backbone infrastructure or to compete with existing fixed and mobile operators at the subscriber level. Yet, policy and regulation for effective broadband connectivity is necessary if firms and households are to take advantage of the many new broadband-enabled services and smart devices becoming available; and if ICT services innovation is to reach into poor and rural communities to offer services that people need.

Public policy has dealt extensively with building an orientation towards economic innovation, particularly emphasising the role of science, engineering and technology (SET) innovation. The 1996 White Paper on Science and Technology gave rise to a series of more specific policy statements, including the National Biotechnology Strategy 2000, the National Research and Development Strategy 2002, and the Innovation Plan 2008. Collectively, these and other policy statements, as well as a small though increasing R&D investment flow, gave rise to the stronger emergence of innovation in industry, construction and the broad services sector. Of particular interest is ICT-based innovation in the services sector, particularly in the banking and financial sector, which has led the ICT adoption curve in business. However, the range of public policy initiatives in the broad SET sector is not matched by public policy initiatives in the ICT and telecoms sectors, which have been neglected on

the policy front. The ICT R&D strategy set down by the Department of Science and Technology in 2007 effectively focused public R&D funding for ICT towards a single institution, the CSIR. While this investment in publicly funded R&D in a public science agency is a necessary part of any broad strategy and the CSIR is an important participant in the innovation system, this approach to ICT R&D funding is too narrowly located to achieve significant innovation impact at the grassroots level. The OECD (2007) review of South Africa's innovation policy points to this problem in its findings "shortcomings of current policy responses", arguing that the concept of an innovation system has been narrowly applied "with too much focus on the role of public R&D-performing institutions" (OECD 2007, p. 8) and a failure to effectively integrate the role of business enterprises and innovation-generating activities other than R&D.

Similarly, micro-economic policy, the responsibility of the Ministry of Trade and Industry, has failed to pay attention to the services sector and its needs, amongst which communications inputs are important. Despite work on policy for the services sector in the mid-2000s, there is today no services sector policy which could act as a lightning rod for e-development. Nevertheless, network infrastructures, including roads, energy and telecommunications have shown strong growth in the past decade, creating the potential for, if not a guarantee of, e-development.

A major player in sector development and governance is the regulator, the Independent Communications Authority of South Africa (ICASA 2009), a converged telecoms and broadcasting regulator established in 2000, integrating previously separate regulators. It is responsible for taking regulatory actions in pursuit of government policy and legislation, in particular to promote development of the broad ICT sector as a competitive economic sector facilitating development in other sectors. However, many of the issues that the 2005 convergence legislation raised for attention were only concluded several years later, and in some cases only after legal challenges to government. This was the case with awarding new licences for electronic communications networks and services or converting existing telecoms licences (licences awarded or converted in 2009); regulating interconnection, specifically call termination rates (regulations gazetted in 2010); and with spectrum management (draft regulations and some final regulations gazetted in 2010). The reluctance to foster competition resulted in more than a decade of high prices (Smit et al. 2008) and the resulting "high access—low usage" scenario for mobile and "low access—low usage" scenario for Internet described in Table 4.2. Average revenue per user (ARPU) for broadband has declined in the period 2004–2010, even while prices have fallen (BMI-T 2010). Policy sluggishness as regards high prices saw the first interventions coming only in late 2009 and leading to regulatory action in 2010 to reduce fixed and mobile call termination rates between 2011 and 2013, an important component of the telecoms pricing structure, but not the only one and not touching on the crucial broadband pricing issue.

Other weaknesses in policy, regulation and strategy in the past decade included the failure to act on the undersea cable monopoly, leaving the market to develop slowly; late attention to key issues in spectrum management including spectrum assignment and fees; and weaknesses in promoting the content sector including the

protracted process for licencing pay TV, the muddle of digital migration; lack of focused attention to creating effective electronic government and the absence of a human resources leadership approach for the present and next generation of the productive workforce. These weaknesses are not those of the communications policy-makers alone, but also of the broader policy community with respect to public administration, trade and industry and the major services departments—health and education. Many, though not all, of these matters are now receiving attention.

A ministerial initiative culminated in July 2010, in the National eSkills Plan of Action (NeSPA). Aiming to address the "calamitous" skills shortage, the (still) draft plan conceives of e-skills as "the ability of people to use and create all forms of ICT to improve life opportunities in their personal and educational spaces; work environments; community interactions, and participation in and contribution to governance processes". The document explicitly refers to e-literacy for employment readiness, as well as skills for e-participation and e-democracy to promote interactive engagement in governance processes, e-business skills, as well as e-community skills aimed at increasing self-reliance and social cohesion. The goals for e-skills development are presented as employment readiness, effective e-governance and service delivery, business development, socio-economic development and research and development (DoC 2010, pp. 2–7).

Practical suggestions include the establishment of *e-skills knowledge centre network hubs* as providing the institutional arrangements which will foster skills development; cross-sectoral collaboration amongst government, industry and higher education; and pricing mechanisms for affordable mobile and Internet connectivity. The plan operates at a level of generality that makes it difficult to understand the possible future evolutionary path for industrial workers, domestic workers and young people who have no access to the Internet, whether via a mobile phone or computing device, whether at home, school or the workplace.

There are two distinct layers, levels or systems of e-transformation in South Africa, namely the mobile ecosystem and the Internet ecosystem. Until 3 years ago, these were distinct and in some ways defined the digital divide in South Africa. Due to the basic societal need for communication and the aggressive marketing of mobile communication, funded by the high profit margins the networks were able to achieve, mobile use became universal in South Africa by 2008. At that point, however, Internet access was still confined to the upper economic segments of society and growth in the Internet user base had been well below 10% for most of the decade. This left penetration, too, at below 10%. This seeming contradiction between saturation of mobile devices among the adult population and only 1 in 10 South Africans having Internet access underlined both the opportunity and the gap in digital South Africa.

The demands on government to liberalise telecommunications tended to fall on deaf ears, even as government claimed the objective of a competitive environment. Two events broke the logjam. The first was a court victory by Altech against the regulator and the Department of Communications (DoC), forcing ICASA to issue electronic communications network licences to all value-added network service providers, 419 companies at the time. The second was the DoC backing off a threat to

block the Seacom undersea cable if it did not have majority government shareholding. With that, the commercial Internet landscape shifted more dramatically than it had since it emerged in South Africa in 1993–1994. Investment in infrastructure, start-up companies and marketing campaigns intensified. As a result, 2008 saw the beginning of a sharp rise in the number of Internet users in South Africa.

In 2010, another fundamental shift occurred. The number of smartphones sold in South Africa reached a critical mass, with more than five million in use. This helped to fuel an explosion in mobile Internet access in South Africa, and the biggest number of new Internet users in a single year in the country's history, 1.5 million, taking the user base to 6.8 million. This trend will continue as smartphone penetration intensifies. It is expected that, by 2013, more smartphones than normal phones will be sold in South Africa. By 2014, it is possible that the Internet user base will reach ten million, or more than 20% of the population. This most visible symbol of the crossing of the digital divide is fuelled not by specific efforts to do so, but by the converging of two separate industries, namely the mobile and the Internet industries, with the first now being the major driver for the second. A decade ago, this could not have been possible.

What has been the contribution to such a shift from the policy-maker, regulator, market, consumers? In many ways, the failure to liberalise was a catalyst for exactly the developments that liberalisation were meant to allow. When policy-makers and regulators tried to hold back newcomers and new technologies, the industry rebelled and began looking for alternative approaches, including court challenges and establishing consortia like Seacom and Dark Fibre Africa. The latter made possible the partnerships between Neotel, MTN and Vodacom to share trenching infrastructure for national fibre grids. These, in turn, are the backbone for the expansion of data networks in South Africa, as well as new partnerships that further expand the fibre and mobile networks, such as the Fibreco joint venture between Cell C, Internet Solution and Convergence Partners.

Over this period, partly due to Internet user growth and smartphone roll-out, the data demands on mobile networks have also intensified, with the networks reporting up to 55% annual growth in data use. This has meant that fibre roll-out has not kept pace with demand. The consumer, therefore, has become as important as the corporate customer in pushing the networks' upgrade efforts. In 2010 alone, Vodacom budgeted R6-billion for network upgrade. According to Dark Fibre Africa, their own fibre roll-out will only meet the "fibre to the tower" needs of the cellular industry by 2014. Thus, beyond policy and legislation, change has been ushered in by the mobile providers, the ISPs and the broad user community through the integration of a multiplicity of applications into the social and economic spheres.

But there is an obstacle to market-driven approaches. While inexpensive offerings such as an e-wallet or mobile payments systems are on the increase, more bandwidth-hungry services such as mobile Internet and mobile TV will remain out of reach for the majority of the population if based solely on the current high-cost market-driven approaches. Amongst a few initiatives to bring down the cost of service, five out of the six metropolitan municipalities have been engaged in building broadband infrastructure. The City of Johannesburg is engaged in a project to introduce 900 km

of fibre-optic broadband around the city in five rings, reaching poorly served areas of the city, such as the Diepsloot informal settlement. This is a public–private partnership between the City of Johannesburg and Ericsson (City of Joburg, 6 May 2011), aiming to promote broadband connectivity in the city for e-learning, e-government, e-health and e-business. The partnership will focus only on core infrastructure to leverage the last mile, but will not compete with household broadband provisioning by the private sector. It aims instead to bring down the private sectors costs, in order to reach more households more quickly. The metro will offer public broadband access at its own community development centres. However, it is not yet apparent that local government interventions will be able to help reduce the growing digital divide.

Whereas South Africa could be riding the wave of digital economic change, it is not yet positioned towards the transformation of economy and society through digital media and electronic services. A few problematic characteristics of the leadership and institutional environment can be observed: Policy and regulatory behaviour appears to rest on the view that disruptive effects such as those that competition or innovation would bring are not desirable. In this, innovation paradigms and current ICT policy are worlds apart. Policy and regulation has tended to be mechanistic, with the regulator ICASA addressing a list of "regulatory issues" such as licencing, number portability and handset subsidies, apparently without a strategic regulatory agenda founded in an understanding of the key interventions that would unlock greater digital access and use. Furthermore, there have been few attempts to engage in monitoring and evaluation (M&E) studies on the state of information society development, the Gauteng provincial government being the first to formulate an M&E framework in 2010. This places South Africa in the response categories: "as ICT is a new and pervasive technology and options abound, we should focus on pilots, micro-interventions and quick wins with no need for overarching national strategy"; and "given speed and uncertainties of technological change, focus on short-term adaptation and serendipity" (see Chap. 1). Policy failures with respect to the information society would seem to arise from policy failures in transformation of the state, economy and society. For example, the schooling system is in crisis with very low completion rates for secondary schooling and evidence that students fare poorly at language, mathematics and physical science (FFC 2011, pp. 72–74). Similar scenarios of policy weakness apply in other portfolios, such as health, where services are in decline and in trade and industry, where policy has not been responsive to the needs of manufacturing, the services sector or small, medium and micro-business.

Despite these impediments, when we review these evolutionary changes in policy and regulation during the first decade of the twenty-first century, we observe five major areas of policy and regulatory change that may contribute to e-development in the next decade. These are

(a) Recognition of the forces of convergence and the resultant transition from telecommunications regulation to electronic services regulation.
(b) Reduction of call termination rates with possible downward pressure on prices.

(c) Attempts, albeit weak attempts, to create enabling policy frameworks for broadband provisioning at national and more importantly at local levels.
(d) Opening up of the undersea cable market.
(e) Attention to the regulation of the radio-frequency spectrum resource.

Collectively, these efforts may create a stronger foundation for e-development in the next decade, but these efforts are by no means sufficient for a services (r)evolution or e-democracy and will require continued ex-ante regulation to promote competitive and innovative markets in e-enabled services for the foreseeable future.

It is clear from the actions and trends discussed here, that South Africa is entering a new era on the other side of the digital divide. While a large proportion of the population remains on the wrong side, never before has so much effort been put into creating a national digital infrastructure. The culmination of this will be that the majority of the adult population could be using the Internet in some form by the end of this decade.

Many lessons have been learned in the process, not least that policy-makers and regulators have a responsibility to facilitate and ease the adoption and roll-out of technology and infrastructure, rather than create obstacles in its way. Recent history offers a clear warning that current regulatory obstacles remain a spike in the wheel of telecommunications progress. This progress will happen, but despite policy-makers, rather than because of them. Perhaps the main lessons from the decade 2000–2010 are the following: (a) Information society (e-development) policy must be systemic across all parts and spheres of government, with multiple active players, even if the results are uneven because of varying capacities and resources; and (b) Policy and regulation require rapid design and implementation, just to stay slightly behind the curve of market development, to pick up the slipstream of innovation and extend it into regions of market failure.

From this perspective, major challenges exist with respect to the "state of the state" and the "capacity of the state", two closely related concepts necessary for socio-economic development in general and e-development in particular. Piccard (2005, pp. 365–366) argues that "The ANC did not inherit a strong state but a weak one", citing numerous sources including Grundy (2000, p. 45) "The capacity of the state to mobilise the necessary resources…the general inadequacies of the infrastructure and human resources left many expectations un-fulfilled" and Bardill (2000, p. 115) "[Capacity problems] include the lack of effective leadership and vision; underdeveloped forms of strategic planning and review; the lack of managerial competence … and the generally low level of skills and capacity throughout the service as a whole". These views are echoed in the 2007 OECD review which finds evidence of failure to consider "the whole innovation sphere"; resources too thinly stretched to reach critical mass with respect to particular innovation focus areas; lack of implementation of identified strategic priorities; limited specialisation with respect to innovation capability and governance; and limited integration "to develop more holistic forms of policy for the innovation system" (OECD 2007, pp. 8–9). Thus, it can be argued that the ANC did not only inherit a weak state, but continued to preside over a weak state, as it failed to increase its policy and implementation capabilities and capacities.

A small policy department such as the Department of Communications, in a weak state with limited capacities, when confronted with major large-scale infrastructure challenges in a new technology paradigm which requires multi-sphere, multi-departmental action, can either rise to or be dazed by the challenge. The slow, conservative gait of the policy-maker with respect to "seeing" the future information society, the actions that either held back progress (failure to introduce infrastructure competition) or were ill-designed to achieve progress (universality policy) or failed to materialise (promoting ICT usage in key sectors such as manufacturing, the services sector and in particular the public education sector, by rallying counterpart ministries) and the absence of any firm response from the broader executive—this action and inaction speaks of a weak state. Similarly, a small poorly resourced regulator, historically cowed or captured by on occasion the policy agency and on occasion the operators, will need to wage a concerted campaign to produce appropriate ex-ante regulation, based on a well-structured agenda. It has also been argued earlier in this chapter that information society policy was uncreative, often adopting positions from other policy environments rather than designing policy from the contextual base of South Africa, and often uninformed by public debate or comment.

Yet states can change, often pushed by external factors. But are such external factors present in South Africa? The first decade of the twenty-first century has seen innumerable street protests in both urban and rural areas, demonstrating against poor local government services. Communities have been most vocal about water and sanitation. They have not been as vocal about health, education or ICT access. Thus, the space has been left to small advocacy organisations which can be more easily ignored.

Conclusion: Building the Twenty-First Century Through Policy and Regulation for e-Development

SA cannot be said to have an e-transformation strategy, as the ISAD Plan 2006 is a set of goals rather than a strategy for e-development. Furthermore, the responsibilities assigned to departments in terms of the plan have been more honoured in the breach than effectively pursued. The national e-skills plan, though new and potentially interesting, is vague on detail and disconnected from other levers for e-development. Provincial and municipal policy and strategy are largely concerned with infrastructure connectivity issues such as broadband or access centres, rather than with e-services. Government is battling in its attempts to address the challenges of transformation in the schooling system, promotion of local economic development and SME advancement. Its energies appear to be more focused on being in government, than in succeeding at development. Pulling success out of the hat of a colonial history and separate development was never going to be easy. But, if government is not addressing the fundamentals of socio-economic transformation, then cross-cutting sectors like ICT are not seen for their potential value.

In order for e-transformation to occur in the society, it is necessary that the ICT sector should co-evolve with the major economic sectors, with advances in the ICT sector pushing forward development in mining, manufacturing, agriculture and services, which are evolving because of other innovations in addition to ICT. With respect to the limited achievements of the past decade, South Africa's state of evolution of broadband, of mobile and Internet access, of electronic content for e-business and e-government, of ICT skills and of institutional leadership is such that the country is not in a state of rapid progress towards economic transformation, as would be desirable for an economy seeking the kind of economic development that reaches beyond middle and high-income households in the urban centres. In particular, given the size and relative importance of the services sector in terms of its contribution to GDP, its importance in household consumption and its role as the key site of value creation by SMEs, ICT infusion and diffusion in the services sector is not yet fostering a services (r)evolution. A complex co-evolution process may, however, in future years constitute a rough, but well-trodden path through the challenges in bringing about the development of a country devastated by separate development (apartheid) to one where cumulative development over a few generations addresses the worst excesses of separateness and poverty.

Alternatively, South Africa can become a failed e-development case. There are four possible contributing factors. First, government's approach to policy, service delivery and development is mechanistic and short-termist, rather than employing responsive and adaptive policy and regulatory approaches. Policy and regulation follows a linear approach credible in the industrial age, an age which is a comfort zone for many decision-makers. In particular, planning is short-term and budgets are designed on a yearly basis with little attention to long-term budgeting for major development-focused transitions. The regulator is hobbled by lack of real independence and limited resources for intensive research. It tends to focus on distinct elements of regulation, a piecemeal approach rather than an overarching one. Second, the frictions typical of a developing economy and society, which give rise to chaos and complexity, are seen as undesirable by policy-makers and bureaucrats, though these are often the factors that drive evolution and transformation. The desire for certainty in the face of complexity tends towards policy as a form of control, rather than policy as a way of working with the flows and viscosity of societal change. The associated business processes are poorly developed or absent, meaning that policy cannot be implemented and is quickly taken over by events. Third, policy for the various economic sectors is split amongst multiple departments at three levels of government, leading to policy vacuums in many provinces and local municipalities; leading also to policy and planning taking place in one ministry or department disconnected from policy and planning in another department, for example, policy formulation in the communications vs. policy formulation in trade and industry or economic planning. Fourth, long-term planning, monitoring and evaluation have not existed historically, though an overarching planning function has been established in the Presidency. It released its diagnostic report in 2011. Monitoring and evaluation as a set of instruments to inform policy is not yet making an impact. These four factors mitigate against a constructive role for policy in e-transformation in South Africa.

What changes are required in the policy and regulatory environment? Concerted action by government will be required to achieve e-development—futuristic thinking at the policy level, possibly through a dedicated information society foresight programme, research-based decision-making at the regulatory level and well-planned, ethical practice at the operational level. A policy agenda should be designed to focus attention to fostering ubiquitous household and workplace broadband for access to Internet and mobile digital content; promoting e-development in the broad services sector not just in banking and tourism; and investment in e-skills advancement throughout the 12 years of schooling, further and higher education. A regulatory agenda should address complementary issues that will promote an information society, including competition with respect to broadband (fixed and mobile) provisioning and pricing, aimed at bringing connectivity to in excess of 50% of households and firms, within given geographic areas, within a set timeframe, laying the foundation for access to new services, a wide range of applications and broadband-enabled services innovation.

What should inform future policy and regulation? Four essential features are proposed: advancing mobility; stimulating the services sector to become an e-services sector; pushing broadband to the household; and promoting ICT in schools.

Given the mobility fostered by the migration of the workforce between cities and rural localities, as well as the mobility within cities particularly for the services sector workforce, e-development in South Africa today appears to follow the trend of mobility. Mobility in communications arises, not only from the capacities of information and communications technologies to foster mobility, but more specifically from the adoption of mobile communications devices and services by people who are already mobile due to history and context. Mobile communications is an important foundation for the information society in South Africa because it is open to innovation, yet affordable. Fixed broadband connectivity will, however, remain important for business and to get households on to the net.

The facilitation of services through electronic media is vital to South Africa's economic future. There are no prospects that the socio-economic status of the majority of South African households will change for the better in the next 2 decades. There will be no growth spurt from oil, mining or high value-added indigenous technologies. Many innovations in mobile applications and e-services are bubbling under and could reshape the landscape, setting an alternative future for the decade to 2020. While electronic services will not be the only platform for fostering development, they have been an important spur for improved services in upper- and some middle-income households (Abrahams and Burke 2010) and there is no particular reason why they should not be an important spur for SMEs and for middle-income and low-income households, given that they bring informational and transactional capability, as well as access to knowledge within easy reach. South Africa may also be able to position itself more effectively in global markets for services through constituting an e-services orientation.

Given the extent of market failure as discussed in this chapter, households may be an important level at which to pitch future policy and regulation for broadband access. Policy and regulatory interventions should consider an approach to universal

access and service that puts household and workplace broadband on the agenda for all local municipalities with more than 10,000 households, whether this development is through stimulating the market through appropriate regulatory interventions, some infrastructure building by provincial governments, or a combination of market stimulation combined with (at best) limited direct contributions from government. As has been argued earlier, the overlap between household and workplace is significant for many small and micro-enterprises, creating an even stronger rationale for broadband policy as economic policy, not merely communications policy.

In combination with a push towards household broadband Internet access, the effective introduction and use of ICT in schools can lead to the creation of learning environments where student and teacher have access to a greater volume and variety of content and where the variety of media makes learning attractive, rather than just routine. Even a small fraction of attractiveness in the learning environment may awaken energies currently lacking in most public school environments. Of the many areas of government services that could be selected for focused attention, it is argued here that schools are *particularly* important, because they are the sites of development of future generations of young South Africans, those who will build the future economy and society. In this next decade, schools will need more than computers, that is more than just inanimate computing devices. They will need animated, content-driven electronic media services—educational podcasts, blogs and wikis and other services yet to be invented, low-cost services generated by teachers and other educational content producers, services that are already available and require elimination of the access barriers that exist in the schools environment.

A shift in thinking is required to focus the regulatory effort towards e-development of the economy and society, rather than the historical focus of policy and regulation towards telecommunications or broadcasting or the particular mechanics of the emergence of these sectors. While the evolution of the these two sectors (telecoms and broadcasting) is important, they are even more important from the perspective of their contribution to the development and revitalisation of other sectors, including strong sectors such as the services sector, declining sectors such as the industrial sector and weak sectors such as mining and agriculture. This is what is meant by policy futurism. Regulatory position papers should sketch out the future of economic development for various sectors in the country with respect to how the integration of ICTs in that particular sector can revitalise the sector, for example, the services sector or e-commerce. Such work can underpin greater regulatory independence and accountability, avoidance of regulatory capture and give regulatory action new vigour.

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