



**national planning
commission**

Department:
The Presidency
REPUBLIC OF SOUTH AFRICA



DIGITAL FUTURES: SOUTH AFRICA'S DIGITAL READINESS FOR THE 'FOURTH INDUSTRIAL REVOLUTION'

Commissioned by the National Planning Commission

With the support of the Konrad Adenauer Stiftung & the International
Development Research Centre

Prepared by Research ICT Africa

Updated August 2020

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PREFACE

Research ICT Africa (RIA) and the University of Cape Town's Nelson Mandela School of Public Governance were commissioned by the National Planning Commission (NPC) to review the National Development Plan (NDP) in terms of South Africa's digital future. This report was completed in 2019 prior to the outbreak of the Covid-19 pandemic and released for public comment in July 2020.

Response to Public Comment

Several submissions noted the significance of updating the report to reflect the impact of the pandemic. In response to the report, submissions also highlighted areas of importance to our digital future that were omitted, or they felt lacked the depth for which they were hoping. Extensive submissions were made on the significant role of broadcasting and digitalisation of the national identity system. Other submissions wanted the report to reflect new developments related to the Competition Commission's data price ruling, as well as the Independent Communications Authority of South Africa's (ICASA) information memorandum on high demand spectrum and temporary spectrum licences that were released to deal with the surge in broadband demand during the lockdown.

Although a number of these issues have been expanded on, the report has not been fully updated from late 2019 to August 2020. Some areas were consciously excluded in the remit of the Commission in order to contain the scope of this assessment. With the resource-intensive diagnostic analysis and benchmarking approach used in the report, a full update would not have been possible in the time available and further, as highlighted below, there is no fresher data for many of the benchmarking datasets. In so far as possible, the issues raised have either been elaborated on or flagged as important areas for future consideration.

Several submissions referenced their preferred digital indices or regulatory toolkits to assess policy outcomes. Although several of these are referred to in the report as they do provide some indication of performance, they have varying utility. Even those that are able to identify poor outcomes in their indicators cannot explain the reason for these failures. They are unable to take into account the political economy of developing countries, which this diagnostic analysis does. Not least of all, they are all underpinned by the International Telecommunications Union (ITU) supply-side data for purposes of global comparison that does not accurately reflect access and use of the Internet in the predominantly pre-paid mobile markets of Africa. The benchmarking and diagnostic analysis adopted for this report uses the demand-side data from the 2018 After Access survey of 20 countries across the Global South. This remains the latest comprehensive nationally representative data on individual mobile communications access and use, in addition to household and informal sector data.

The pandemic has indeed highlighted the importance of having accurate digital data for public planning purposes. As government departments, international agencies and development banks scramble around for information, the need for the regular collection of good, in-depth demand-side

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data as part of publicly accessible national information systems cannot be emphasised sufficiently. It is only with nationally representative demand-side data that national data can be disaggregated by gender, income, education and location to enable modelling that identifies the factors underpinning digital inequality. Notwithstanding its significance for planning the reconstruction of the economy, such data is going to be crucial to better leverage technologies for future disaster or public health management, which the country has not been able to optimise in this pandemic.

However, more importantly, updating the report with the limited new data or regulations, introduced in the past half-year, would not substantively change the analysis or recommendations because they do not change the poor policy outcomes of the past decade that the analysis highlights.

The first component of the digital futures review, as requested by the NPC, was to review progress made towards realising the digital vision of the country, as expressed in the NDP released in 2011 and operationalised in the national broadband policy and plan, SA Connect (2013). The NDP identifies the need for a broadband communication system to underpin a dynamic, connected, inclusive, equitable and prosperous information society and knowledge economy conceived as an:

"... ecosystem of digital networks, services, applications, content and devices, (that) will be firmly integrated into the economic and social fabric of the country...(providing) an enabling platform for economic enterprise, active citizenship and social engagement and innovation. It will: connect public administration to the active citizen; promote economic growth, development and competitiveness; drive the creation of decent work; underpin nation-building and strengthen social cohesion; and support local, national and regional integration".

It appears the country may again be on the cusp of some regulatory breakthroughs in relation to the release of high demand spectrum, the remedying of dominance in the market with the ongoing market review, and the implementation of the critical rapid deployment guidelines. However, these are the same regulatory bottlenecks identified in the NDP Diagnostic Report a decade ago. It will be a very positive step if these proceed as planned within the coming year. Even having addressed these longstanding backlogs, there will still be other major challenges to citizens' ability to mitigate the effects of the next inevitable pandemic or disaster more equitably than has happened with Covid-19.

The second component of this review was to assess the NDP against any course corrections that might be required for South Africa to achieve this digital vision in the context of the rapid changes resulting from the intensifying but uneven and inequitable, global processes of digitalisation and datafication. The report addresses this question in relation to the 'Fourth Industrial Revolution' (4IR), which has been placed at the centre of digital policy in the country. The report argues that a technologically determinist, generally ahistorical and often futurist lens associated with 4IR blueprints - currently the only lens on our digital future - cannot deliver on the inclusive and equitable vision espoused in the NDP as essential to our progress.

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Rather than an extension of the processes of digitalisation and datafication, the 4IR is generally presented as distinguishable by the unique merging of human and technological realms. Characterised as disruptive, it is often defined in terms of the advanced technologies of artificial intelligence, machine learning, advanced robotics, 3D-printing and the like. This approach is reflected in the report of the 4IR Commission recently presented to the President on the basis of a year-long study. The eight key recommendations include: building human capacity in the area of the 4IR, establishing the National Artificial Intelligence Institute, creating the Advanced Manufacturing Institute (AMI), the establishment of a National Data Centre, and incentivising SMMEs for the adoption of 4IR technologies and the emergence of future industries and platforms.

These are important areas of development that should form a critical part of the transversal digital policy to harness the efficiency and productivity gains associated with digitalisation and datafication. They also require governance frameworks to ensure they are accessible beyond a small global elite and that they are able to safeguard citizens' rights, prevent known harms and mitigate associated risks.

In the report it is argued that to fully harness the powerful capabilities of these advanced technologies to contribute to the national policy priorities of job creation, poverty alleviation and equality, certain preconditions would need to be met. These include putting in place the long-neglected supply-side measures to improve affordable and meaningful digital access. However, even if they are attended to urgently, they are not sufficient on their own. Arguably more important are the demand-side strategies required to increase the absorptive capacity of users, firms, citizens and the awareness of data subjects that fuel the platform economy - not only engineers, coders or data scientists - and will be an essential aspect of the economic reconstruction of the country.

This report seeks to build bridges between these advanced technologies that in the current context have the potential to contain pandemics, manage disasters and enhance public service delivery and the current reality in which the country has been unable largely to harness them to contain the virus. Despite internationally applauded early moves to set up disaster management regulations based on an innovative rights-protecting public surveillance framework for data collection, the low density of smartphones for contact tracing apps to work, insufficient data from marginalised groups to overcome algorithmic biases in machine-learning solutions, and the inability of the state to co-ordinate, analyse and automate big data for contact tracing have frustrated efforts to deploy these available technologies to contain the virus.

The continuities of these processes of digitalisation and more recently datafication are as much defining characteristics as are the disruptive innovations that spur their evolution. Without urgent intervention, one of these continuities will be the digital inequality that marks the intensification of these processes. South Africa must prepare urgently for the next general-purpose technology, Artificial Intelligence (AI), as it is already in use. However simply overlaying advanced technologies over existing inequalities will compound inequality in the country as the pandemic and lockdowns

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so starkly highlights. The country however does not have the luxury of dealing with these challenges sequentially. This report argues that in redressing digital inequality, the institutional and regulatory bottlenecks and capability challenges in the state will enable the country to optimise the potential of advancing technologies more equitably for national development so that it can be a driver of regional integration and trade and for global competitiveness.

Digital Inequality Paradox

Paradoxically, digital inequality is increasing as more people are connected. As technologies advance, this is increasingly not only the case between those online and those offline but also between those who have the technical and financial resources to use the Internet optimally and those who are barely online. The latter includes those who only have partial access to poor-quality or expensive data services that do not permit them to be 'always on' or to use data-intensive services. The gap is widening between those who passively consume a limited number of basic services and those able to put technology to full, productive use, some even to enhance their prosperity.

The governance of this increasingly complex, adaptive global system (and for developing companies, the digital inequality paradox) is arguably, after climate change, one of the wickedest policy problems facing nations. Like, climate change, the Internet and other related global public goods (such as cybersecurity and data) only emerge to the extent that all countries help produce them.

Similarly, as more people who do not have the awareness or skills to exercise their rights go online, vulnerability to the risk increases. Without digital literacy, people are unlikely to be able to exercise their rights when using apps and services that collect personal information and use algorithms to target their advertising or which can be used by governments for surveillance.

The pandemic has brought digital inequality into stark relief, highlighting the urgency with which digital inequality needs to be addressed in order to prepare the country for the next inevitable disaster or pandemic. Only a relatively small elite within the formal economy has been able to manage Covid-19-related public health lockdowns by moving their work, schooling, food sourcing and business relief applications online. Although half of the country do own smartphones and have access to the Internet, for many this is intermittent and at low capacity. For the significant numbers of South Africans concentrated in rural areas, townships and informal settlements without access to online services, the lockdowns have resulted in the rupture of informal value chains, disruption of schooling and access to feeding schemes, inability to receive social security pay-outs or to apply for Covid-19 relief. This has resulted in a major food security crisis. The potential destruction of these survivalist economies demonstrates that the informal economy is unable to serve as the usual buffer to economic shocks for many families and communities.

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Priority Actions for Post-Covid-19 Economic Reconstruction

The devastation of the pandemic has provided us with an opportunity to reset our economies and societies to reduce the negative impacts of hyper-globalisation in today's inter-dependent world and the inequitable impacts on developing countries. With the increasing complexity and adaptiveness of the global communications system, both new and traditional forms of governance are proving incapable of providing adequate tools for the governance of global public goods such as the Internet, cybersecurity and data. Undergirded as the global economy is by unevenly distributed global digital networks, this hyper-globalised environment brings with it new policy challenges but also opportunities of global governance to mitigate the risks associated with increasing digitalisation and datafication, and ensure the realisation of global public goods at the national level, through mechanisms such as the global digital tax.

At the national level, this will entail developing a new, more equitable and inclusive social compact to underpin economic and social reconstruction, of which digital inclusion will be a crucial enabler. The digital readiness of the country to optimise opportunities such as those offered by the African Continental Free Trade Movement, and within the processes of global tax regime reform, has the potential to expand both economic activity and the tax base required for greater social investment and protection.

What is required is a transversal digital policy with an integrated and complementary set of institutional arrangements. It will require co-ordination of the tensions that arise from the traditionally distinct mandates of the sector regulators (such as broadcasting, energy, finance and telecommunications) and the cross-sector regulators responsible for safeguarding information-related rights (privacy and freedom of expression) and for competition. Such a comprehensive policy will necessitate a shift from the sectoral silo in which digital policy has traditionally been formulated to a national project enabling the necessary integration required across the public sector - particularly international affairs, trade and revenue services - as well as coordination between the public and private sectors to meet the needs of the country in an increasingly globalised economy.

In the short term, the dual strategies of rapid and effective implementation of what is known to work, and policy experimentation in the areas that are not working need to be fast-tracked in order to get the right mix of recovery, regulation and redistribution. At every point of policy and regulatory intervention, solutions should be focused on ways in which more enterprises, - formal and informal - households and individuals can be brought actively online.

Highlighting the urgency with which this needs to be done, two approaches to dealing with immediate affordable access issues are emphasised here. The first is to implement urgently critical policies, laws and regulations in infrastructure industries that are known to be essential to functioning markets, which we have failed to do for over a decade. The other approach is to stop doing things we have done that, on the basis of evidence, have not or are not working, and start

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experimenting with alternative strategies.

The first approach refers to the major reasons identified in the report for the country failing to meet either its 2016 or 2020 broadband targets and being way off its underlying ICT targets and those of the associated 2030 UN Sustainable Development Goals. These include the continued policy uncertainty and the same regulatory bottlenecks identified in the NDP Diagnostic Report a decade ago including the failure to release high-demand spectrum, the failure to conduct the market review and remedy dominance in the market through wholesale access regulation, and the failure to introduce the rights of way to enable rapid single build deployment. In all cases, the underlying studies, and sometimes even the arising regulations, have been drafted but not implemented, which speaks to institutional challenges and instances of state and industry capture.

Although the unprecedented scale of the pandemic has plunged even the most advanced economies into recession, the social and economic impact on individuals, households and even small businesses could have better mitigated the effects of the crisis through digital substitution of goods and services, had the broadband policies and strategies and targets of SA Connect been realised.

If these critical competition levers had been implemented, one might not have seen the extent of arguable 'market failure' with nearly half of South Africans being unable to affordably access services to mitigate the negative effects of the lockdown. While over the last decade the country has seen significant competitive and complementary investments in networks that have resulted in extensive broadband coverage of over 95% of the population, only half of South Africans have access to the Internet, including only 24% of informal sector businesses. This is due to policy uncertainty, the lack of spectrum and the failure to connect all public buildings through the leveraging of private investments as proposed by SA Connect.

The report highlights the need for an integrated supply- and demand- side digital policy and governance framework that creates the critical (hard and soft) infrastructure required for a functional digital economy and human and institutional resources to operate it. This will require balancing our traditional bias in favour of supply-side valuation in the allocation of resources over the last 20 years of market reform with a demand-side valuation for key resources (like spectrum or data) to properly recognise and account for their public utility.

The lack of implementation of the integrated infrastructure plan leveraging public and private investments that was proposed in the national broadband policy and plan, SA Connect, has been a major factor in South Africa not meeting the 2016 and 2020 targets in the plan, particularly that of connecting all public buildings with broadband and free public Wi-Fi. The strategy to achieve this in the plan was through the government offering long-term anchor tenancy to open access network providers, thereby shifting unaffordable capex expectations and risk from the public sector to the private sector and leaving the government only responsible for its own operational expenditure. This could be revived to crowd-in productive private investments. This was however

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never implemented. Instead, the flailing and under-resourced state-owned broadband company was made the broadband champion responsible for servicing underserved areas. The need for the rationalisation of the state-owned entities in the sector is addressed in the report in the context of them operating in a highly competitive industry, unlike many other state-owned entities.

Efforts to increase access through public Wi-Fi for every public building as specified in SA Connect, for example, are critical to provide more equitable access to citizens. However, this kind of intervention, like the data retail price reductions mandated by the Competition Commission, do not bring the 50% of the population who are offline online, primarily due to the cost of devices. Likewise, the proposed life-line data bundle proposed by the Commission may assist price-sensitive users but it does not present a strategy for including those currently marginalised from services.

Critical digital infrastructure such as the governance and operational systems, networks and assets that are essential to the security, economy and the public's health and/or safety are currently unevenly developed and unco-ordinated but exist in national infrastructure plans, cybersecurity, and data protection instruments. Some of them have been sent back from the Presidency or Parliament for failing to pass constitutional muster. Others have been passed into law but not been operationalised, while yet others are now outdated and no longer align with global norms and standards. These, together with the institutional arrangements that govern them, are all critical elements of an integrated national digital policy and will require review and updating to provide the accessible, safe and trusted environment conducive to greater online e-government, e-commerce and e-trade. This will require much greater levels of state and private sector co-ordination and participation in global governance to promote and protect South Africa's interests.

Data has an extremely high value in the information and knowledge era. It is in this context that data and information can be understood as a public good – available to whomever might need it on a non-rivalrous, non-exclusionary basis – whether for public policy planning or to make more symmetrical market information available to new commercial entrants, community-based entities and start-ups, or for consumers to make more informed choices. South Africa needs a strong open data policy, that uses the existing data protection and right to information legislation to protect the privacy, anonymity and re-identification of private information when required for common good.¹ The need for open data policies with the necessary safeguards for private information and algorithmic transparency are required not only because of their value for commerce and innovation but also for public planning purposes, as has been highlighted by Covid-19.

Although the country put together, at short notice, an impressive framework to safeguard citizens' privacy rights in order to exploit mobile data for contact tracing, the lack of capacity to automate and integrate government information systems means that contact tracing has happened manually and slowly. The public sector needs to institutionalise the role and value of data for effective service

¹ NDP (2020) Digital Futures

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delivery. The history of digital IDs and the issues around the SASSA misuse of data by third parties, highlight the need for an integrated data framework within the public sector. This is connected to the need for the digitalisation of the public sector to be speeded up to improve interdepartmental communication as well as the efficiency and effectiveness of service provision in education, health, social welfare and other sectors.

Getting telecommunications markets functioning requires recognition of the importance of autonomous sector regulation free from political and industry capture, with the technocratic capabilities to ensure the competitiveness of markets. There are a number of critical regulatory bottlenecks that have had negative effects on the competitiveness of the industry and its ability to meet demand that could, with some leadership and political will, be removed with immediate positive impact not only on the sector but the national economy. These include the long overdue release of high-demand spectrum and the effective regulation of market dominance and wholesale access regulation that would permit smaller players to compete more fairly and allow more service providers into the market to improve competition, drive down prices and generally improve consumer welfare.

Even if these bottlenecks are removed and incumbent operators were effectively regulated, it is likely that the price of services based on current commercial, supply-side valuation of resources in the licensing and business models would not be affordable to a significant number of people. Alongside the business evolution of current market players, alternative and complementary business models, licensing frameworks and market structuring need to be enabled to allow for the entry of more players and lower-cost options of delivery and licensing. This includes deployment of lower cost secondary spectrum use technologies in underutilised rural spectrum, increasing lower cost, higher speed satellite spectrum to rural areas, and, once the initial connections are made, connecting to local fibre networks that are cheaper and of a far higher quality.

The release of temporary spectrum to meet the surge in demand during the lockdown, although positively setting aside spectrum for TV white space use, could have been used to experiment with the entry of low-power, community, niche providers to use unused spectrum, secondary spectrum and require infrastructure sharing. The assignment of spectrum to the likely winners of high-demand spectrum later in the year, while a useful regulatory test of that mechanism, has resulted in the immediate rollout of 5G services, privileging those who already enjoy high-speed bandwidth. Auction outcomes could still ensure that high demand spectrum licences are conditional on meeting the needs of underserved or competitively served communities, in 3G or 4G, require spectrum sharing or enable access to new low-power players on the 5G spectrum.

In this regard, and especially in the context of the economic crisis and increased national debt to deal with Covid-19, the state should carefully weigh the short-term gains of maximising auction

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prices with longer term benefits associated with conditional licences, as described above, that will expand the digital economy and make it more inclusive. In the longer term, this is more likely to increase the tax for social investment and protection through more productive corporate taxes that will accrue from more widespread digital commerce and trade, compared to an auction fee windfall that is likely to be recovered from users and consumers by operators or who may inhibit their network investments or rollout.

Universal access strategies that bring marginalized populations online need to be devised. Despite the failure of universal service funds as documented in the report and the challenges faced by the Universal Service Agency of South Africa leading to the proposed scrapping of such programmes, if funds remain after the settling of the set-top box dispute, these could be used to subsidise low-cost smart phones for needy people by providing rebates on purchases or tax rebates to operators who provide them to the needy. Such initiatives have been successfully rolled out in Malaysia and Costa Rica and may be a way of reaching people relatively quickly to mitigate the effects of the next pandemic. Further, government should immediately remove the excise duties on entry level feature phones, which would allow around a third of those currently offline who wish to have a phone, to afford to purchase one.

The pandemic, and particularly the economic devastation wrought by the lockdown, has laid bare the unevenness of digital resources in cities and municipalities across the country. This compounds existing spatial inequalities shaped by apartheid legacies and now widely perpetuated by income and wealth inequality and lack of urban mobility. These spatial patterns have produced some of the most unequal and fragmented cities in the world where affluent neighbourhoods abut overcrowded, poorly serviced townships and sprawling informal settlements. If, instead of the commercial, supply-side valuation driving the allocation of resources to the new mega-city proposed for Lanseria at a cost of R84 billion, a demand-side valuation of the digital demand was prioritised, those funds could be diverted to supporting the development of smart townships and smart villages to redress digital inequality and enable greater social and economic inclusion. Such an integrated local government strategy that supports the evenness of delivery, not only within cities but between them and smaller municipalities, could be a critical element of the new social compact that the President has committed the country to, in the economic reconstruction of the economy.

Finally, the state should be more actively engaged in the G20 and OECD international taxation reform negotiations seeking to ensure, through the Global Digital Tax, that companies (such as global monopoly platforms) pay taxes in jurisdictions they raise revenues from even if they do not have a physical presence in the country. This would not only create a fairer tax regime for local digital platforms but also dramatically improve the size and sustainability of the tax base for social protection and social investment required to safeguard and prepare the country for the digital future.

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LIST OF ABBREVIATIONS

4IR	Fourth Industrial Revolution
ACE	Africa Coast
AI	Artificial Intelligence
ANC	African National Congress
ARPU	Average revenue per user
BBI	Broadband Infracore
BITF	Black Information Technology Forum
BPESA	Business Process Enabling South Africa
BPO	Business Process Outsourcing
BTS	Base Transceiver Station
CHPC	Centre for High-Performance Computing
CiTi	Cape Innovation and Technological Initiative
CRC	Cyber Response Committee
CSIR	Council for Scientific and Industrial Research
DCDT	Department of Communications and Digital Technologies
DDF	Digital Development Fund
DHET	Department of Higher Education and Training
DOC	Department of Communications
DST	Department of Science and Technology
DTI	Department of Trade and Industry
DTPS	Department of Telecommunications & Postal Services
EASSy	East African Submarine Cable System
ECA	Electronic Communications Act
ECNS	electronic communications network service
EMU	Economic And Monetary Union
ECTA	Electronic Communications and Transactions Act
FET	Further Education and Training
FIP&T	Future Industrial Production & Technologies
FOC	Freedom Online Coalition
FTTH	fibre-to-the-home
GB	Gigabyte
GCIS	Government Information and Communications System
GDP	Gross Domestic Product
GNI	Gross National Income
GSMA	Global Mobile Industry Association
HEIs	Higher Education Institutions
HHI	Herfindahl-Hirschman Index
HRDCSA	Human Resources Development Council of South Africa
IBA	Independent Broadcasting Authority
ICASA	the Independent Communications Authority of South Africa
ICT	Information, Communication and Technology

LIST OF ABBREVIATIONS

ICT4D	Information and Communication Technology for Development
IDI	ICT Development Index
IETF	Internet Engineering Task Force
IGF	Internet Governance Forum
IPAP	Industrial Policy Action Plan
JCPS	Crime Prevention and Security
MMA	Media Monitoring Africa
MoU	Minutes Of Use
MTRs	Mobile Termination Rates
MVNOs	Mobile Virtual Network Operators
NACI	National Advisory Council on Innovation
NCPF	National Cyber Policy Framework
NDP	National Development Plan
NeSDI	National e-Skills Dialogue Initiative
NeSPA	National e-Skills Plan of Action
NLD	National Long Distance
NPC	National Planning Commission
NRF	National Research Foundation
NSI	National System of Innovation
OTT	Over-The-Top
PICC	Presidential Infrastructure Coordinating Commission
POPI	Protection of Personal Information
R&D	research and development and innovation
RAMP	RIA Mobile Pricing
RDI	ICT Research, Development and Innovation
SATRA	South African Telecommunications Regulatory Authority
SDGs	Sustainable Development goals,
SITA	State Information Technology Agency
SKA	Square Kilometre Array
SNO	Second National Operator
SNO	second network operator
STBs	set-top boxes
STI	Science, Technology and Innovation
AfCFTA	African Continental Free Trade Agreement
USAASA	Universal Service and Access Agency of South Africa
USOs	Universal Service Obligations
WACS	West African Cable System
WOAN	Wireless Open-Access Network
WTO	World Trade Organization
WIPO	World Intellectual Property Organization

EXECUTIVE SUMMARY

In 2019, Research ICT Africa (RIA) and the University of Cape Town's Nelson Mandela School of Public Governance were commissioned by the National Planning Commission (NPC) to review the National Development Plan (NDP) in terms of South Africa's readiness for the 'Fourth Industrial Revolution' (4IR) and for an assessment of any course corrections required for planning our digital future. Although the report is critical of the narrow and technologically determinist conception of our digital future that a 4IR lens usually provides, it engages with the concept as it has been placed at the centre of national digital policy and resource allocation.

We do so in order to highlight the need for a much broader, inclusive and just digital policy that grapples with - arguably after climate change - one of the wickedest policy problems currently on the planet: the governance of the digital inequality paradox. With the increasingly globalised processes of digitalisation and datafication, the more people are connected to the Internet - albeit it highly unevenly or even where not directly connected - the greater inequality becomes, because they become the data subjects of commercial and public digital systems. This is not only between those who are connected and those who are not but also between those barely online, passively consuming tiny bits of data, and those able to actively consume services, reducing their transaction costs and asymmetries of information, and even productively contributing to the wealth of nations.

Simply layering increased advanced technologies over existing structural inequalities will exacerbate, not improve digital inequality. The call for a transversal digital policy in this report is based on the need to prioritise redressing inequality at every policy and regulatory point of intervention. In that way, a policy can emerge that is able to propose iterative strategies or bridges from the current highly unequal digital environment to create the conditions for widespread deployment of the most advanced production practices and future general-purpose technologies such as artificial intelligence (AI), expanding from a small global elite to governments, firms, citizen and workers, so that they are able to fulfil their transformative potential.

With digitalisation increasingly affecting every aspect of the economy and society, the report is only able to deal with a selection of the core aspects of our increasingly globalised digital future within the time and resources constraints of this exercise. Several areas of digital opportunity are therefore not dealt with in the report or are simply flagged for future reference. As the Commission was particularly concerned with the potential of the digital economy as a lever of economic growth, job creation and poverty alleviation, this report focuses on critical policy, regulatory and institutional bottlenecks that may prevent the country from realising that potential. With many of these previously identified in various specialised reports on different aspects of policy or regulation, this report seeks not only to consolidate these into a single high-level review but undertakes a diagnostic analysis of the problems to identify the reasons for poor policy outcomes in order to remedy the situation by way of recommendations.

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This review of the NDP in terms of our readiness for the 'digital future' proceeds in seven chapters.

Chapter one introduces the digital ecosystem and the complexities of the ongoing 'digitalisation' phenomenon.

Chapter two provides an assessment of the progress made in the telecommunications sector as one of the key economic infrastructures in the NDP since 2012. It analyses the institutional arrangements and market structure arising from the foundational sector law and policy, focusing on developments since 2012 and highlighting some of the legacy issues that continue to have a negative impact on policy outcomes.

In **chapters three and four**, the paper assesses policy outcomes against the central policy objective of affordable access to communication for all. Key indicators such as pricing, Internet penetration, coverage/reach of networks and quality of service are benchmarked to determine the effectiveness of regulation and competition in the market.

Chapter five defines the notion of the 4IR. This World Economic Forum (WEF) discourse has commanded centre stage over the last few years, leaving other critical policy processes in abeyance. Without much critical engagement with the concept or the powerful interests it represents, South Africa has been swept up in the global hype around the 4IR. While 4IR technologies are presented as having the potential to propel digitally-ready countries into a new age of unprecedented economic prosperity, it is important to assess how far South Africa has gone in meeting the preconditions for this advanced technological take-off.

Chapter six provides a broad identification of the preconditions and enablers that a cross-cutting digital policy would need to include. These cross-sectoral public and private strategies would require integration and co-ordination for South Africa to develop an organic national digital policy in the developing country context that is increasingly integrated into the global economy.

Chapter seven concludes with a set of recommendations for issues the government needs to address if South Africa is to achieve the end goals of the NDP.

While the advanced technologies of AI, machine learning, robotics and blockchain do have development potential, this paper warns that the unevenness of digital development in South Africa will intensify in the absence of policy interventions that redress the underlying structural inequalities in the economy and society. It also calls for strategies to enable greater digital inclusion while acknowledging potential harms from the misuse and abuse of the Internet, and mitigating the risks associated with large numbers of citizens coming online for the first time.

This review proposes a policy approach that is more citizen-centred, with an emphasis on human development as the key strategic asset in the digital era. In line with the South African Constitution,

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this approach is aimed at reducing inequality and enabling the exercise of peoples' rights online in order to achieve greater social and economic inclusion not only in an increasingly globalised digital economy but also in the regional economy, especially as the African Continental Free Trade Agreement (ACFTA) develops.

National Development Plan and digitalisation

The primary focus of the NDP is to eliminate income poverty and inequality as well as to increase employment. However, since 2012, the economy has contracted as a result of a global recession and mismanagement of critical areas of the national economy. In the NDP, the information, communication and technology (ICT) sector forms part of the economic infrastructures required to effectively operate an industrial and increasingly services-based economy.

The ICT action plan, therefore, prioritises the establishment of a national, regional and municipal fibre-optic network to provide the backbone for broadband access driven by private investment and complemented by the public funds required to meet social objectives.

The ICT sector can be an enabler of growth and job creation but a prerequisite for this is an enabling policy and regulatory environment. Although the development of a knowledge economy (an economy that is underpinned by the ICT sector) was one of the objectives of the national economic policy (the New Growth Path), since the inception of the NDP, South Africa's economy has slowed to the point of recession and unemployment remains intractable. As a result, most industries have struggled to inject value, opportunities and jobs into the market.

Policy developments since 2012

The National Integrated ICT Policy states that in order to have a vibrant and inclusive knowledge economy, there is a need to provide affordable access to communication (equity), increase accessibility of services, devices, infrastructure and content to all citizens (accessibility), improve the quality of life (social development), and ensure proper data governance (user protections) – all preconditions of an equitable digital economy and society.

The protracted process that produced the wide-ranging policy paper was meant to be translated into omnibus legislation consisting of four parts: the Electronic Communications and Transactions Act (ECTA) 25 of 2002; the Independent Communications Authority of South Africa (ICASA) Act 13 of 2000 as amended in 2014, the Electronic Communications Act (ECA) 36 of 2005; and the Telecommunications Act of 1996, as amended in 2001 and 2004. Only the Electronic Communications Amendment Bill, which included the controversial wireless open-access network (WOAN), came before the sixth Parliament but was withdrawn by the government shortly before the May 2019 elections.

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In 2013, following the release of the NDP, the government gazetted the national broadband policy plan and strategy, SA Connect, which sought to operationalise core elements of the NDP. This was followed by the adoption of the National Integrated ICT White Paper by Cabinet in 2016, the process for which had started even before SA Connect. The policy and plan sought to contribute to the NDP goal of a seamless system of networks by optimally using private and public investments to develop the critical infrastructure and services required for a modern economy.

The implementation, however, was delayed and what was intended by SA Connect to be an incentivised system to attract the significant private investment needed to meet the ambitious national targets of connecting all unconnected schools and other public buildings became a marginal connectivity project lead by the undercapitalised state-owned company, Broadband Infraco, and the limited connectivity provided through Universal Service and Access Agency of South Africa (USAASA).

National economic outcomes have compounded sectoral uncertainties created by a lack of continuity in policy formulation and leadership in the communications sector. The rapid turnover of Ministers and Directors-General, as well as the splitting of the Communications Ministry into two departments – one for Communications, and another for Telecommunications and Postal Services – exacerbated already extensive delays in meeting the digital migration deadline of July 2015, which remains uncompleted.

Institutional failure

The failure of the broadcast digital migration process and the debacle over the release of high-demand spectrum are two of the more striking examples of what appears to be institutional failure. The separation of the Ministry of Communications into two in 2014 extensively undermined convergence legislation and regulations, leaving critical policy and regulatory actions in limbo. This decision exacerbated the leadership and policy continuity challenges that have plagued the sector as well as the lack of institutional capacity in both departments and the regulator. While the President announced soon after coming into office that the two departments resulting from the split in the Communications Department would be re-merged as part of the Cabinet rationalisation following the May 2019 elections and appointed a single Minister for Communications, the departments are still functioning separately as they try to unravel the administrative dimension of the merger. Strong leadership will be required to weld the department back together in order for it to play the critical policy role required by its appointment to lead and co-ordinate government's efforts to prepare for the '4IR'.

Weak political appointments to key institutions, coupled with a lack of leadership, have consistently plagued the Department of Communications (DOC), Department of Telecommunications and Postal Services (DTPS), ICASA and the USAASA. All these institutions have also been paralysed at various times by charges of corruption and mismanagement and the resultant suspensions of

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senior personnel. Together, these factors all served to undermine the vision of the NDP for the sector as the cornerstone of an equitable and resilient digital economy.

Strong market growth but suboptimal policy and regulatory outcomes

The communications market has grown significantly in this uncertain environment, with tens of billions of Rands in private investments in the extension of fibre networks and upgrading of mobile networks to support the roll-out of data services annually. Despite the introduction of a horizontal licensing regime over a decade ago, the market remains structured around several integrated network and services operators. MTN and Vodacom, in particular, dominate the mobile telecommunications market with a total market share of 78%.

This dominance in a data environment has been driven more by quality of service than price, which Vodacom in particular has used to drive its competitive advantage. Together, Vodacom and MTN have invested on average R15 billion annually over the past five years and the later entrants in the mobile market, Cell C and Telkom Mobile, have not been able to gain significant market share despite their substantial investments and considerably lower prices. Cell C and Telkom's subscriber market share is estimated at 17% and 5%, respectively, although the latter is expanding at the expense of the former.

Responding to increased independent open-access fibre competition, the historical incumbent Telkom underwent a massive strategic turnaround from 2010. It voluntarily extended the functional separation imposed by the Competition Commission to a full separation of its network into an open-access common carrier network, Open Serve, and its previously bloated services have been streamlined dramatically. The acquisition of Neotel by Liquid Telecom has also had a positive effect in this competitive communications market, as Liquid has access to close on 70 000 km of cross-border, metro and access fibre networks, spanning 15 countries across Africa. This puts South Africa in a position where it can leverage cross-border networks and investments.

However, the major concern in the 2011 NDP Diagnostic Report was that despite significant growth in the ICT sector over the past 15 years, there was not nearly sufficient progress towards the primary policy objectives of universal and affordable access to the full range of communications services. It is important to note that telecommunication networks are well-developed in the urban and semi-urban areas with considerable gaps remaining in rural areas.

Many rural areas have only one or two operators, usually the dominant operators. These rural communities do not have the benefits of competitive service offerings, with few being able to receive the lower-priced Cell C or Telkom mobile services, or those now offered by low-cost virtual mobile networks operating only in the major centres. As in the case of the mobile network, competition in the fibre market is largely in the municipal areas and on the main transmission

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routes, with most residential areas remaining without fibre connectivity to the home and with competition only on the main intercity transmission routes. The implications of lower Internet penetration and high data prices for policymaking are that consumers at the top end of the market are well-served and get value from their products while the poor are paying a premium for low-value products, thereby preventing them from using the Internet optimally. It is clear that even with effectively regulated prices, the cost of services within current business models and licensing frameworks are simply not affordable for large numbers of people in South Africa.

In addition, the rationalisation of state-owned entities (together with the mandatory inquiry into a national open-access network required by SA Connect) has been a protracted process with arguably suboptimal outcomes. Contrary to policy intentions, Broadband Infraco (BBI), together with Sentech and the State Information Technology Agency (SITA) were designated by the government to be the lead agencies for SA Connect, with BBI focusing on fibre roll-out. Consequently, the network is marginal with most of its capacity leased from Liquid, Telkom and Dark Fibre Africa, in addition to the Transnet and Eskom communications networks on which it was established.

The rationale for merging BBI with Sentech is that unlike BBI, which only has an electronic services licence as a common carrier network, Sentech has an electronic communications network service (ECNS) licence. This means that the merged entity will be able to offer an integrated network and services. With BBI being as undercapitalised as it is, it remains to be seen whether the merged entity can compete with the cutting-edge next generation networks and services of Telkom-BCX, Vodacom, MTN Enterprise or Liquid Telecom. In the meantime, BBI's primary business is to serve as an aggregator for the project to connect public buildings undertaken by DTPS in the name of SA Connect, although this was not the proposed process in the broadband plan.

Regulatory and Policy Recommendations

Rather than focusing narrowly on the potential and dangers of so-called 4IR technologies, South Africa needs to develop a transversal digital policy that is far more comprehensive than one focusing on AI, machine learning, blockchain and drones (although these would be important forward-looking parts). In order for the NDP to properly inform the development of a digital economy, it will need to propose a comprehensive, integrated national project to optimise global digitalisation trends in the interest of all. The policy needs to address the entire ICT ecosystem. Such an integrated policy will enable the country to create the necessary conditions to harness the benefits of advanced technological developments and mitigate the risks associated with them. This will need to cut across all government departments to enable the high level of integrated planning, implementation, and public and private sector co-ordination required for an equitable and competitive digital economy.

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Furthermore, although the ICT sector has significant value as a sector in and of itself, it needs to be understood as a key input in all other sectors. With the correct complementary policies and strategies, it can drive new services in an increasingly service-based economy, creating new opportunities and potential efficiencies in the formal and informal sectors. The benchmarking against similar size economies in the report demonstrates that South Africa has the potential to perform better digitally and more in line with the size and sophistication of its economy than currently.

While the 4IR is a convenient way of packaging history and for mobilising people, the current diversion of policy focus and resources from existing supply- and demand-side challenges will affect the country's ability to respond effectively and equitably to the advancement of technology. Although rather militaristically packaged as politically revolutionary, overlaying 4IR technologies with existing inequalities will not solve unemployment or alleviate poverty but rather amplify them. This digital inequality paradox - that as more people are connected to more advanced technology, inequality increases - is one of the most intractable policy problems facing governments today, more so in countries such as South Africa, with such extreme levels of social and economic inequality.

Integrated infrastructure planning and institutional arrangements

At the heart of the so-called 4IR is an upsurge in the collection and processing of data. The governance of critical digital infrastructure will have to include data and privacy protection, cybersecurity, cybercrime and anti-surveillance measures to create a trusted environment in which e-government, e-commerce and democratic engagement, and personal communications can flourish. From a public policy perspective, the need for data access and transparency is crucial to ensure fairness. In order to identify opportunities for the future, there is a need for public information regarding the availability of ICT resources and how they currently are or are not utilised.

The government needs to make sure that the country is ready for this change by developing specialised institutional capacity to deal with this complex and adaptive ICT ecosystem. From a governance perspective, there is a need to develop appropriate institutional arrangements and to have the right skills to engage robustly but cooperatively, with the structures of global governance increasingly responsible for the delivery of global public goods such as the Internet.

As far as key enabling infrastructure is concerned, digital infrastructure and services such as base stations, data warehouses and cloud providers are dependent on extensive, high-quality, stable power supplies and transportation systems. South Africa therefore needs an integrated infrastructure plan in order to prepare itself for the digital (modern) economy.

Without adequate preparation, South Africa will not be able to adopt new production methodologies that will emerge as a result of advanced technology. In addition to the correct regulations, data governance, infrastructure and skills to embark on the development of the 4IR

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or to evolve towards a more digitally-advanced economy, it is equally crucial to enable innovative public-private interplays at various levels of government. We will need to work with and empower start-ups addressing some of these challenges.

Create an enabling environment for broadband extension

SA Connect proposed the leveraging of public and private investments to connect public buildings in underserved areas through smart public procurement and the provision of anchor tenancies that would drive services into these areas. The failure to implement this strategy has meant that the 2016 targets in the broadband plan were never met and as things stand, it is impossible for the 2020 targets to be met. Government should revisit the broadband plan, review the proposed strategies and proceed swiftly with implementation.

South Africa needs more innovative regulatory and competitive frameworks and adaptive institutions, utilising dynamic efficiency models that are able to deal with new, complex and adaptive international communications systems. New forms of communications should not be subject to competition regulation based on the static efficiency models traditionally used in telecommunications. If applied instrumentally in this dynamic environment - where services, platforms or applications that appear competitive may in fact be complementary - these old models can stifle innovation.

Regulation

Market Review: Although the South African telecommunications market continues to be relatively developed and advanced compared to the other countries on the African continent, there are still gaps on the supply side (encompassing both infrastructural and regulatory issues) that constrain the creation of the affordable backbone and services required to develop a digital economy. To deal with supply-side gaps, ICASA must create a fair, competitive environment for multiple players in the market by publishing the findings of its market review and applying the necessary pro-competitive remedies, in particular with regard to entities enjoying significant market power. Care should be taken not to repeat the experience with the previous two market reviews, which were undertaken at significant public cost but on which the Council never made a determination.

A review of current digital infrastructure policies, including telecom licensing and regulatory regimes is also needed to: update outmoded regulatory and business models, introduce an enabling regime for multiple players and facilitate the adoption of more cost-effective technologies that allow micro and niche business models to meet the needs of diverse users.

National and co-shared infrastructure: Complementary investments, such as in national transmission fibre, should be encouraged as part of the national strategic infrastructure plan, as should commercial infrastructure sharing, which will reduce the high cost of duplicating networks.

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Although this is already happening on a commercial basis, further incentivising infrastructure sharing and wholesale regulation of facilities and bandwidth will reduce input costs for service providers and private networks. This, however, requires a fair, competitive environment in which all players can compete in this relatively small market. Where practices are anti-competitive or some players are excluded simply as a result of dominance, ICASA should investigate the need for mandatory infrastructure sharing at regulated cost-plus prices.

Spectrum: Spectrum policy must also be reviewed to ensure more optimal co-existence of licensed and unlicensed spectrum while prioritising affordable access to communications. This will require both demand-side and supply-side spectrum valuation and resource allocation methods. While only the commercial value of spectrum has historically been recognised, demand-side valuation is equally important from an equitable public policy perspective, to recognise the social good value of spectrum for general purpose use through public access or commons models.

Spectrum required for the evolution of existing commercial services needs to be assigned at a competitively determined (efficient use) price to ensure the build-out of capital-intensive networks benefiting from economies of scale. However, with evidence proving that even cost-based GSM prices are unaffordable for most South Africans, spectrum should also be made available for secondary use. Nationally allocated spectrum not in use in rural areas must be made available as low-cost or licence-exempt spectrum for communities, non-profit providers or micro-cell or low-power operators.

Data governance and justice

Although there have been several initiatives emanating from different government departments, an integrated data governance framework within the context of the constitutionally enshrined Bill of Rights will be essential to developing the trusted framework required for people to use online services.

Development of data and privacy protection, cybersecurity, cybercrime and anti-surveillance systems will need to take the central stage in the governance of digital infrastructure. The Protection of Personal Information (POPI) Act needs to be fully implemented and the Cybercrime Bill should be enacted. Increasing co-ordination amongst departments and improving administrative and technological skills within the institutions will be critical to ensure the Cybercrime Bill's full functionality. To foster data justice, a framework should be instituted to prevent harm and mitigate the risks associated with the rapid expansion of digital services and large numbers of people coming online for the first time.

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Rationalisation of state-owned entities

Government should implement processes to prevent multiple state-owned entities from competing with one another, and merge public entities into a single operation or into viable private operators who can make the assets work better. The rationale for the integration of BBI, Sentech and SITA needs to be made clearer and more transparent.

USAASA, the USAF and USOs

With the absorption of USAASA's regulatory functions under the proposed economic regulator, the rationality and effectiveness of having a universal service fund at all, needs to be reviewed. Universal access and service mechanisms should be re-assessed in the context of the increasing availability of Internet-enabled devices and multiple points of public access. Greater co-ordination is needed among specialised governance bodies, including ICASA (on content and infrastructure), the Information Commissioner and associated agencies such as the USAASA to leverage these trends (for example, by providing free public Wi-Fi access).

Human development

Apart from access to affordable connectivity and devices, there is also a need to digitally upskill people to operate or work with the advanced and/or emerging technology in 4IR. Investments in human development and digital skills are necessary to build a pipeline of future talent that can embrace this dynamic and increasingly digitised environment. This will require a massive educational overhaul that addresses basic education backlogs at all levels, from basic to tertiary education. Labour development programs should be created to leverage innovative public-private interplays such as youth job accelerator initiatives and business processing outsourcing so as to harness resources and skills where they exist in the country in order to fill expertise gaps in the state.

Digitisation of the public sector

Digitisation of the public sector should be speeded up to improve interdepartmental information flows as well as the efficiency and effectiveness of service provision in education, health, social welfare and other sectors. Discussion of the State IT Agency's new integrated enterprise model was scheduled but not heard by Parliament before the close of the last administration. The success of the model will depend on a massive change-management (skills and mindset) exercise not only within the moribund State IT Agency but also across the public sector. Ensuring that this plan is instituted effectively is a vitally important priority.

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Open data and consolidated national indicators

There is a core set of indicators that all organisations require - all have identified the need for demand-side data (via nationally representative surveys) to supplement administrative supply-side data and the limited set of ICT indicators from the census and the annual national household survey conducted by Statistics South Africa (Stats SA). Historically, all data has been collected on an ad hoc basis when resources could be secured. This needs to be regularised, standardised and institutionalised and framed within the context of an open-data policy that safeguards privacy rights and enables the free flow of information required for more effective planning by government and service delivery entities, and for private use by entrepreneurial and innovative enterprises.

Multidisciplinary Research and innovation system

An integrated multidisciplinary research and innovation system is required to deal with the crosscutting nature of digitisation. Processes should be developed to publicly identify the digital policy needs of government so that public institutions can be funded to develop research agendas individually and collectively in support of them. While there have been millions of Rands of public investment in technology and innovation, there has been almost no public investment in digital policy. Various initiatives over the years have been made possible by donor funding, with the associated peripatetic funding. Some of the funding slated for large 4IR initiatives should be channelled to the NRF to drive the digital policy research and data collection required for local, evidence-based policy on the country's more immediate digital environment.

Regional harmonisation and global governance

Government must represent South Africa's interests in regional and international governance forums where international and cross-jurisdictional rules are being determined. Challenges of global governance lie in the increasing complexity and adaptiveness of the global communications system over which nation states, and particularly developing countries, appear to have little control. Multiple, competing interests coalesce around these contemporary digital governance questions. Much greater integration of international affairs, trade and communications departments is required to influence outcomes in favour of South Africa and those countries that align with its interests in matters of global governance (including digital trade, global taxation initiatives of digital platforms, data governance and technical governance of the Internet).

1. INTRODUCTION

Digitalisation on a planetary scale is a defining force in socio-economic transformation in the 21st century. Technological innovation and economic liberalisation have caused a fundamental shift in the global economy in the past four decades, dramatically affecting power relations and productive forces at global, national and local levels. In today's information era, information generation, processing and transmission critically define who benefits from the transformative potential of information societies, as information and knowledge are both central to human freedom and development.²

In the same way as with mobile voice services, the rise of the mobile Internet has delivered this potential to developing countries across the globe. Given that mobile digital technologies have successfully connected millions of Africans to mobile voice and data services, as well as the various ways in which these technologies have contributed to socio-economic development, ICTs are seen as a critical vehicle for developing countries to progress toward the United Nations' 2030 Agenda for Sustainable Development (encapsulating the sustainable development goals (SDGs)). While none of the SDGs are specifically about ICTs, several goals acknowledge their enabling nature and include them in their targets. The Agenda recognises that the spread of information and communication technology and global interconnectedness has great potential to accelerate human progress, to bridge the digital divide and to develop knowledge societies³.

In line with the international development agenda's emphasis on digital technologies as enablers of development, information and communication technologies (ICTs) have also been identified in South Africa's National Development Plan (NDP) as critical elements in building a more inclusive society by eliminating poverty and reducing inequality in the country.

The increasing global significance of ICT in public policy draws on evidence that broadband investments and increased penetration contribute to job creation and stimulate economic growth.⁴ ICTs have been shown to not only reduce transaction costs, ease information flows and improve outputs⁵ but to also enhance the general well-being of those who are connected to the Internet.⁶

² Sen, A. (1999). *Development as Freedom*. New York: Alfred Knopf; Castells, M. & P. Himanen. (2013). *Reconceptualizing Development in the Global Information Age*. London, UK: Oxford University Press

³ United Nations. (2015). *Transforming our World: The 2030 Agenda for Sustainable Development*. United Nations A/RES/70/1

⁴ Sridhar, K.S. & Sridhar, V. (2008). *Telecommunications Infrastructure and Economic Growth: Evidence from Developing Countries*. *Applied Econometrics and International Development* 7(2); Kim, Y., Kelly, T. & Raja, S. (2010). *Building broadband: Strategies and policies for the developing world* (English). Washington, DC: World Bank; Qiang, C. (2009). *Telecommunications and Economic Growth*

⁵ Gruber, H., Hätönen, J. & Koutroumpis, P. (2014). *Broadband access in the EU: An assessment of future economic benefits*. *Telecommunications Policy* 38(11): 1046-1058

⁶ Unpublished working paper. Washington, DC: World Bank; Czernich, N., Falck, O., Kretschmer, T. & Woessmann, T. (2011). *Broadband Infrastructure and Economic Growth*. *Economic Journal* 121(552)

1. INTRODUCTION - *continued*

A more holistic approach to digital inclusion is important to better understand the indirect effects that widespread Internet adoption has had on economies and societies, including those segments and communities that remain unconnected.

Most of the policy interventions recommended by development banks and multilateral institutions on the basis of this research have proposed supply-side interventions to bridge so-called 'digital divides' – or the discrepancy between those who can access and use ICTs and those who cannot.

Network effects and economic growth

There is also increasing evidence of linkages between telecommunications infrastructure investment and secondary improvements in the economy through information and transaction efficiencies. These network externalities compound as network connections increase. However, for countries to enjoy the network externalities associated with broadband infrastructure investments, a critical mass has to be reached.

For voice, this critical mass was traditionally around 40%. Due to the multiplier effects associated with broadband, the critical mass threshold for broadband is much lower – estimated at only 20%. Despite that, many countries in Africa have not reached this critical mass and, accordingly, do not experience or witness these positive multipliers.

Even with an Internet penetration rate of 51%, South Africa does not appear to be experiencing positive network effects to the same degree as countries with similar Internet penetration levels and GDPs per capita. This may be because nationally aggregated indicators mask the extreme inequalities that exist between people in South Africa.

It also suggests that supply-side constraints of availability, price and the quality of communication are not the only factors that have an impact on Internet access and use. Demand-side barriers are as important to consider in policy formulation, including factors such as the affordability of devices and services, the educational capacity or skills to utilise digital services, and the availability of relevant and local content in used languages.

⁷ Katz, R. & Koutroumpis, P. (2014). Using a digitisation index to measure the economic and social impact of digital agendas. *ResearchGate* 16(1): 32–44. Accessed at: https://www.researchgate.net/profile/Pantelis_Koutroumpis/publication/270806225_Using_a_digitization_index_to_measure_the_economic_and_social_impact_of_digital_agendas/links/59c0c15faca272aff2e4d436/Using-a-digitization-index-to-measure-the-economic-and-social-impact-of-digital-agendas.pdf

⁸ Williams, M. D. J. (2010). *Broadband for Africa: Developing Backbone Communication Networks*. Infodev, World Bank. Available at: <https://openknowledge.worldbank.org/bitstream/handle/10986/2422/536430PUB0Broa101%20official0Use0only1.pdf?sequence=1>

⁹ Waverman, L., Meschi, M., & Fuss, M. (2005). The impact of telecoms on economic growth in developing countries. *The Vodafone policy paper series*, 2(03), 10–24. Available at: <http://www.enlightenmenteconomics.com/assets/africamobile.pdf>

¹⁰ However, research on network effects has largely been undertaken in the Global North, where broadband connectivity is associated with high intensity of use.

¹¹ Gillwald, A. & Mothobi, O. (2019). A Demand-side View of Mobile Internet from 10 African Countries. Policy Paper No. 5, Research ICT Africa. Available at: https://researchictafrica.net/wp/wp-content/uploads/2019/05/2019_After-Access_Africa-Comparative-report.pdf

1. INTRODUCTION - *continued*

As we move from voice to data services, our policies need to reflect an awareness of the fact that the value of the network not only improves due to powerful network effects as the number of people or devices on it increases (by being connected) but the value for individuals can also be unevenly optimised according to the technical and financial resources they have to exploit the potential of the networks they are on. While connectivity is clearly a precondition of digital inclusion, connectivity in a data environment, on its own, does not redress digital inequality.

Digital inequality

In fact, paradoxically, as more people are connected, digital inequality is increasing. Rising shifts of income from labour to capital and a drop in mid-level jobs in many countries suggest that the gains from greater use of technology will not be equitably shared without significant policy interventions.¹²

This is not only the case between those online and those offline (as is the case in a voice and basic text environment) but also between those who have the technical and financial resources to use the Internet optimally and those who are barely online. The latter includes those who only have partial access to poor-quality or expensive data services that do not permit them to be 'always on' or to use data-intensive services. The gap is widening between those who passively consume a limited number of basic services and those able to put technology to full, productive use, or for some even to enhance their prosperity.

Similarly, as more people who do not have the awareness or skills to exercise their rights go online, they are more vulnerable to the risks that accompany their use of new applications (apps) and services that collect personal information and use algorithms to target their advertising, or to the ways in which governments can survey them, than those who have the knowledge or skills to mitigate such risks.

This digital-inequality paradox is arguably the biggest policy challenge for nations in an increasingly fractured global, digital economy and society. The intractability of this policy problem lies in the increasing complexity and adaptiveness of the global communications system over which nation states, and particularly developing countries, have little control.

Yet, under these conditions of flux and uncertainty, countries must create the conditions necessary to attract the massive infrastructure investments required for these technological developments to permeate throughout the economy and society, while managing the inevitable impacts of digitisation and globalisation at the national level.

¹² Van Reenen, J. (2019). Where Will Future Jobs and Growth Come From? Public Lecture, London School of Economics, 22 May 2019. Available at: <http://www.lse.ac.uk/Events/2019/05/20190522t1830vOT/Where-Will-Future-Jobs-and-Growth-Come-From>

1. INTRODUCTION - *continued*

We should not take for granted that technology will translate to wage or productivity growth unless we develop a good set of complementary policies at business and government levels. Management at both these levels will be critical to developing a policy agenda that not only boosts productivity but also shares benefits among the citizenry and creates inclusive prosperity. Technology is not reducing the quantity of jobs but rather the quality of jobs, producing polarisation in the labour market with ramifications for the unemployed.¹³

In order to identify the necessary points of policy intervention in the complex and adaptive global information system, as well as their implications due to the linkages between the different elements within this system, it is useful to conceptualise it as an ecosystem.

1.1. Digital ecosystem

An essential policy shift required from a traditional telecommunication perspective is to view 'digitalisation' not as something occurring only within a single sector or even only as a national jurisdictional issue. Rather, it is a complex ecosystem that spans the entire economy and society at a national level while also being inextricably connected to, and interlinked with, global markets and systems of governance. The digital environment should be envisaged as an ecosystem of high capacity, high speed and quality electronic networks, services, applications and content that enhances the variety, uses and value of ICTs for different types of users through complementary private and public access.

The different elements are integrally related: a blockage or problem in one part of the ecosystem has an impact on the functionality of other parts of the global ecosystem. The overall health of the system is determined by the policies, strategies and processes that enable the functionality of the whole system, and the evolution and innovation of solutions to weaknesses or blockages in the system.

Conceptualised as an ecosystem (Figure 1: Multi-layered governance of digital ecosystem) the relationships between different elements and the outcomes resulting from their interactions can be assessed. More importantly, this approach places users, citizens and consumers at the centre of the ecosystem. Their access to and the affordability of the networks, services, applications and content in the ecosystem will determine the degree to which they will be able to participate in and be included or be excluded from the ecosystem.

Pricing and quality are the factors that connect these elements and have a significant impact on access and affordability. Quality, in particular, is growing more important in increasingly bandwidth-hungry broadband environments.

¹³ Van Reenen, J. (2019). Where Will Future Jobs and Growth Come From? Public Lecture, London School of Economics, 22 May 2019. Available at: <http://www.lse.ac.uk/Events/2019/05/20190522t1830vOT/Where-Will-Future-Jobs-and-Growth-Come-From>

1. INTRODUCTION - *continued*

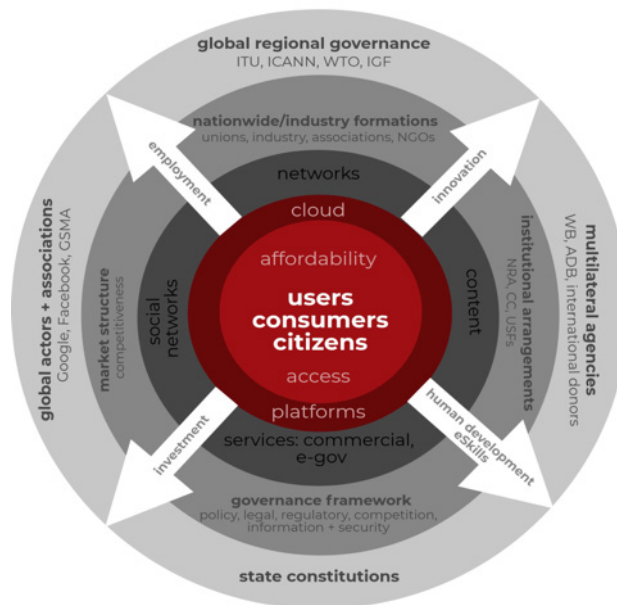


Figure 1: Multi-layered governance of digital ecosystem

Source: RIA (2014) How ordinary people got connected despite the connected people

These factors are outcomes of the market structure and the effectiveness of regulations, which are themselves determined by the policy and legal framework in the context of the political economy. These conditions are shaped by the market structure, how competitive the services are that arise from it, and how effectively they are regulated. The capacity of the regulator is determined, at least to some degree, by institutional arrangements and the regulator's autonomy to implement policy. The levels of efficiency and innovation that enable the evolution of the ecosystem depend on the availability of skills and competencies of people and institutions at each node within the ecosystem and their ability to harness the benefits associated with integrated networks for economic development as well as for social and political engagement.¹⁵

The environment created by the interplay of these elements, as well as the nature of the relationships and processes between and within them, determines the technology investment that is required to drive growth in the sector and broader economy. These more traditional digital services are then overlaid with new, 'free' and paying platforms and applications (including cloud), of which some serve as more cost-effective substitutes for more traditional services while others provide new audio and video complementary services.

¹⁴ Research ICT Africa. (2014). How Ordinary People Got Connected Despite the Connected People. Available at: <https://researchictafrica.net/2015/04/16/how-ordinary-people-got-connected/>

¹⁵ Gillwald, A., Moyo, M., & Stork, C. (2012). Understanding what is happening in ICT in South Africa: A supply- and demand-side analysis of the ICT sector. Cape Town: Research ICT Africa. Available at: http://www.researchictafrica.net/publications/Evidence_for_ICT_Policy_Action/Policy_Paper_7_-_Understanding_what_is_happening_in_ICT_in_South_Africa.pdf

1. INTRODUCTION - *continued*

All these services drive demand for bandwidth and generate massive amounts of data, which are used by platforms to target their advertising at users, to respond to demand and stimulate appetite for consumption. This also enables big-data analytics that hold potential for commercial purposes, as much as for national policy, planning and implementation. The extensive collection, storage and analysis of data feed the algorithms underpinning AI, machine learning, robotics and drones.

These and other technologies of the 4IR are entirely dependent on the functioning of the 'Third Industrial Revolution' of computerisation and automation, which is, in turn, intrinsically connected to contemporary forms of the 'Second Industrial Revolution' of energy technology. In fact, network- and data-intensive technologies such as these (especially blockchain) require significant amounts of power to operate, often costing more than the bandwidth they use. This means that the stable and high-quality supply of energy is as critical as communication infrastructure in the digital ecosystem.

The institutional endowments of the country, including the design and capacity of the institutions, determine the nature and levels of investment as well as the effectiveness of competition regulation to enhance consumer welfare and create the conditions for innovation. Without governance systems able to adapt and deal with the increasing complexity of the digital ecosystem, digital technological development is likely to exacerbate inequality rather than promote greater opportunity and shared prosperity.

1.2. Methodology

A diagnostic approach was adopted, drawing on the available empirical data gathered from primary and secondary sources that are validated through triangulation and analysis. The diagnostic analysis started with a policy, legal and regulatory review to ascertain the policy objectives and the legal and regulatory progress with implementation. The NDP was reviewed, specifically with regard to the role of the ICT sector as a critical aspect of the country's economic infrastructure (see Appendix 1).

The applicability of the digital vision for the country, together with the developments in sector policy to attain it, was assessed to determine whether there is an enabling environment for a competitive and equitable digital economy and society. The regulatory framework and progress made towards the implementation of policy since 2013 were assessed, especially insofar as the policy sets up the institutional arrangements and market structure for the sector, which determines policy outcomes. This was done by examining some key supply-side and demand-side indicators. The demand-side insights were drawn from Research ICT Africa's 2017 After Access survey, which provides accurate descriptive statistics for pre-paid mobile markets that are not available elsewhere. As it is a nationally representative survey, it enables modelling that can identify intersectional aspects of inequality and their specific points of policy intervention in order to redress them.

1. INTRODUCTION - *continued*

As part of the diagnostic analysis, a benchmarking exercise was undertaken to evaluate the South African ICT sector policy and regulatory outcomes in relation to coverage and reach, access, affordability, quality of service and competition. Although competition is not a policy goal but rather a resource allocation strategy to achieve policy objectives, it provides a composite measure of these other market outcomes and, as such, is used in the diagnostic analysis. This benchmarking methodology is dynamic in nature, based on a careful selection of appropriate comparator countries and a defined set of indicators that are selected according to the policy issue being analysed.

As a guideline, the relevant criteria for choosing comparator countries were level of economic development, regional factors, geographic or locational factors, and population size, where possible.

Policy framework and institutional arrangements: The policy and legal framework from which the associated institutional arrangements and market structure arise was analysed in terms of the linkages between policy (aspiration), legislation and regulation (implementation) and operation (sector performance). Arising from this, the policy and regulatory outcomes were then assessed and benchmarked, where possible, in terms of coverage and reach, access and use, affordability and quality of service, together with the composite indicator of competition.

Coverage and reach: Fair competition provides an incentive for mobile operators to invest in infrastructure in order to make their networks as widely available as possible and to guarantee an appropriate quality of service.

The analysis measured both the extent and quality of the infrastructure available in a country, along with network coverage i.e. how much of the population has access to a mobile signal of at least 3G. Network coverage is measured by the number of subscribers per base transceiver station (BTS) where these data are available. The level of investment is further expressed as investment per subscriber.

Access and use: Usage measures the consumption of mobile services such as voice and the Internet. Traffic measures the average minutes per MB used per subscriber. Content is a difficult indicator to assess due to the global nature of the Internet as content is consumed from around the world. The category of access was defined by a set of indicators capturing the prevalence of mobile connection devices as well as Internet use. Although supply-side data can provide total numbers of active SIMs, it is only through nationally representative surveys, such as the one undertaken for this report, that the number of unique users can be measured with any degree of accuracy in pre-paid mobile environments. Access is linked to affordability because lower prices lead to greater access and use.

Pricing and affordability: Price can be a key supply-side indicator of the level of competition in the sector. The pricing of mobile voice and data services remains a key factor in any assessment of the

1. INTRODUCTION - *continued*

sector's performance. If mobile voice and data prices (analysed in accordance with GNI or GDP per capita) are high in comparison to the benchmarked countries, then the causes of high prices need to be assessed. In most countries where the mobile voice market is reaching maturity, prices have been in steady decline. In comparison, mobile data is a rapidly growing market and prices are far more volatile. In countries where both voice and data prices are high, there are usually significant obstacles to competition, with the associated barriers to affordable access and usage.

Quality of service: In the broadband environment, with data-substituted voice and text services, the quality of services (data speed and latency) has become a critical determinant of consumer preference. In order to measure this in South Africa, mobile broadband performance test results were collected between 2013 and 2017 using NetRadar, an application that provides neutral information about the quality of mobile Internet connections and mobile devices. Data was thus collected anonymously from users and sent to a central server. The tests varied and were affected by different factors including the location of the test, the speed of movement of the users when the test was carried out, the time of day, and the degree of congestion of the network at a particular moment. Such demand-side data is also able to provide insights into consumers' preferences and the significance of service quality to different users for the various activities they undertake.

Competition: The competition component is, in fact, a policy instrument or means of achieving policy objectives, rather than a policy outcome in and of itself. It is included as an indicator for analytical purposes because it has been identified as cutting across the other components. Fair competition in the sector leads to reasonable returns on investment for operators and affordable prices for end users. Competition is measured using a standard concentration measure (the Herfindahl-Hirschman Index) but the degree to which competition is present in a market determines the degree to which other indicators are progressing towards the attainment of national objectives. The diagnostic approach also includes best performers in order to provide aspirational goals and to understand what makes those countries more effective in meeting national policy objectives. Depending on the selection of countries and criteria, the performance of the country being assessed may shift from positive to negative.

It is from this supply-side analysis together with demand-side insights, where available, that the evidence base for specific interventions by policymakers and regulators is derived. The different types of data enable the triangulation of the supply- and demand-side data with both document analysis and stakeholder insights derived from interviews, in order to compare outcomes with policy goals and regulatory objectives. On this basis, it makes recommendations on points of policy and regulatory intervention to improve sectoral outcomes. These are included in the final set of regulations proposed for digitalisation to be dealt with as a cross-cutting national policy, rather than simply a sectoral and infrastructural issue.

2. POLICY DEVELOPMENTS

At the heart of the so-called 4IR is an upsurge in the collection and processing of data. In the era of digitalisation, data has assumed a significant role in socio-economic development as it is considered a strategic and critical resource for data-driven economies – now referred to as 'datafication'. However, while the socio-economic benefits of big data analysis cannot be ignored, data governance frameworks for transparent and accountable processing of personal information (prior to aggregation) are necessary to safeguard rights of access to information and privacy that have implications for other fundamental rights.

The increasing availability of digital data is driving a shift in policy making worldwide from being data-informed to being data-driven. In contrast, the collection and processing of massive amounts of personal data has become an increasingly contentious issue because the computing-analysis of this 'big data' allows researchers, private and public sector organisations alike to infer people's movements, activities and behaviour, presenting ethical, political and practical implications for the way people are treated and seen. However, these developments are also central activities within the emerging economic activities of all countries.

New technological developments such as AI, blockchain, cloud computing, drones and the Internet of Things (IoT) produce, store and analyse an unprecedented amount of data adding urgency to the need for regulating data protection. The use of AI and machine learning for behavioural profiling for tailored products and services is challenging the global principles on data protection related to the collection of data for specific purposes, minimality and limitations on further processing. Cloud computing has quickly risen to prominence, disrupting traditional models related to data storage and distribution, having repercussions in various areas such as law, business and society. The connection of the Internet to inanimate devices and systems such as IoT, AI, machine learning and other emerging technologies have a direct implication in terms of data storing, processing and management, considering that data can be now produced, stored and analysed by machines without human interventions.

Data protection is central to build a trusted and secure digital environment and is a pre-condition for the adoption and absorption of emerging technologies in Africa. However, there are a variety of other data-related aspects for policy that must be considered for regulating/controlling the digital economy. Before presenting the outcomes of the diagnostic exercise, this section starts with a reflection on available data to undertake such an analysis. It starts with a review of South Africa's position on global digital indices, the problems with the available global data, and the limited utility of indices - this highlights the need for good national digital statistics even in a 'big data' environment.

2. POLICY DEVELOPMENTS - *continued*

2.1. National Policy and Planning

The NDP's primary focus is on eliminating income poverty by reducing 'the proportion of households with a monthly income of below R419 per person [in 2009 prices] from 39 per cent to zero'. It also highlights the importance of reducing inequality as measured by the Gini coefficient, which should fall from 0.69 to 0.6, and increasing employment – with targets for the unemployment rate to drop from 24.9% in June 2012 to 14% by 2020 and to 6% by 2030. With this in mind, the NDP expected total employment to rise to 24 million.

On paper, South Africa has long recognised communications networks as the backbone of the modern economy and society. The National Development Plan (2011) that provides a framework in which to realise South Africa's vision that by 2030 suggests that "...a widespread broadband communication system will underpin a dynamic and connected vibrant information society and a knowledge economy that is more inclusive, equitable and prosperous." Yet, national commitments to ICTs that followed the NDP in the Presidential Infrastructure Coordinating Commission (PICC) and via the national broadband policy and plan, SA Connect, have failed to meet set targets or make significant progress to meet specified objectives. Given the appropriate policy and regulatory conditions, the ICT sector can, however, serve as an important enabler of growth. As a key input for other sectors in an increasingly digital economy, and through the creation of new services and formal and informal employment, the ICT sector has the potential to perform far better than it does on global rankings, and more in line with the size, promise and sophistication of South Africa's economy. To do so, the country will require a comprehensive, integrated strategy to optimise global digitalisation trends in the interests of all.

One of the key job-creation drivers identified as part of the economic policy, the New Growth Path, is the knowledge economy – an economy that is underpinned by the ICT sector. Yet South Africa's economy has slowed to the point of contraction in the past three years and most industries have struggled to inject value, opportunities and jobs into the market. At the core of this stasis and the failure to progress was the decision, in 2014, to separate the former Ministry of Communications into two departments: DTPS, and a new DOC, responsible for content and digital migration. As part of the separation, the converged regulator ICASA and Government Communications and Information System (GCIS), along with the public broadcaster, were mandated to report to the new DOC.

2. POLICY DEVELOPMENTS - *continued*

This division not only raised concerns about constitutionally protected institutions being clustered with government public relations but it also undermined a decade of convergence legislation and regulations, leaving critical policy and regulatory actions in limbo. The decision exacerbated the leadership and policy continuity challenges that have plagued the sector, as well as the lack of institutional capacity in both departments. Together, these factors all undermined the NDP vision for the sector of an equitable and resilient digital economy.

While the two departments have since been merged again and now ostensibly function as one entity under the new administration, legal legacy issues will take some time to unscramble and it will require strong leadership to weld the department back together in order for it to play the critical policy role desperately needed.

2.1.1. Review of the NDP Diagnostic Report

Among other things, the NDP sought to deal with some of the disappointing policy outcomes of telecommunications reform identified in the Diagnostic Report. The primary concern listed was that despite significant growth in the ICT sector over the previous 15 years, the essential policy objective of affordable access to the full range of communications services had not been realised. One of the outcomes that the Diagnostic Report identified was the failure to address legacy issues relating to incorrect sequencing of the establishment of an independent regulator prior to the liberalisation of the sector. The latter should, in turn, have preceded privatisation as it continued to produce suboptimal policy outcomes. Some related concerns cited in the Report include:

- the poor telecommunications market structure, resulting in overt dominance in the fixed and mobile markets;
- conflicts of interest within the institutional arrangements that inhibited effective regulation of the sector;
- a lack of technical capacity in the regulatory authority and the policymaking department, as well as leadership challenges in both;
- a lack of fair access to bottleneck facilities on which competitors depend, which produced high wholesale rates and, consequently, high end-user prices (that, in turn, inhibit access and use); and
- a lack of policy co-ordination between different departments responsible for policy in the sector and also between them and the implementing agencies.

A particular concern was the extended exclusivity period granted to Telkom to attract strategic equity partners, which had resulted in the unregulated extraction and repatriation of monopoly profits. The entrenchment of Telkom's dominance in the network continued long after the official end of its monopoly. Compounded by anti-competitive practices, it had the effect of undermining competition in the wholesale and retail sector and therefore leading to the inability to reduce prices. Although the growing mobile market, from where the majority of people were getting access to communications for the first time, provided some competition to Telkom on voice services,

2. POLICY DEVELOPMENTS - *continued*

the delayed introduction of a third competitor, Cell C, also made it difficult for this operator to compete effectively with the entrenched duopoly. It was largely unable to build a sizeable-enough market share to put pricing pressure on the incumbents.

While the sector has expanded significantly since 2012, with intensive investment in next generation fixed and mobile networks, excessive profits have been concentrated in a few companies. The undercapitalised national broadband company has not been able to compete successfully and has been squeezed out by private-sector investment.

Many of the conditions that produced these poor policy outcomes persist today. South Africa's position on the International Telecommunications Union's ICT Development Index (IDI) continues to decline - from the 84th place in 2011 to 92nd place in 2017. This is particularly concerning given how the country compares to former comparator countries such as Malaysia, Turkey and South Korea, which were all peers of South Africa twenty years earlier when they were ranked together in around 40th place on the IDI. (South Korea, for instance, is now one of the top performers on the IDI.)

Although mobile services continue to grow, challenges remain around universal access and particularly usage as a result of the high prices of communication devices and services in the country. Besides constraining the optimal usage of new technologies and services for consumers, the cost of communications has undermined South Africa's global competitiveness.

The high input cost of communications has affected investment decisions on the location of regional headquarters and particularly communication-intensive businesses, such as business process outsourcing, which South Africa might otherwise have been well placed to offer and, in doing so, create much-needed local employment.

Delays and protracted court battles also characterised the earlier entry of a third operator (Cell C) into the mobile market, enabling the duopoly operators MTN and Vodacom to double their subscriber numbers in the time it took to finally licence Cell C. Together, Cell C and subsequently, Telkom Mobile and the second network operator, Neotel, continue to have limited opportunity for their market share to rise much above 15% of the market.¹⁶ None of these three operators have been able to provide any serious challenge to MTN and Vodacom. In addition, these incumbents have been able to leverage their dominance in the emerging data market.

Some of the regulatory remedies for the poor competitive outcomes in the market eventually found their way into the public consultation process for the Electronic Communications Act (2005). The instrument of a market review to determine dominance in the market, although arguably

¹⁶ Gillwald, A., Moyo, M. & Stork, C. (2012). Understanding what is happening in ICT in South Africa: A supply- and demand-side analysis of the ICT sector. Cape Town: Research ICT Africa. Available at: http://www.researchictafrica.net/publications/Evidence_for_ICT_Policy_Action/Policy_Paper_7_-_Understanding_what_is_happening_in_ICT_in_South_Africa.pdf

2. POLICY DEVELOPMENTS - *continued*

unnecessarily cumbersome as legislated in Chapter 10 of the Act, was a pro-competitive measure. Had it been implemented, it could have dealt with the growing concentration and dominance of fixed and mobile incumbents in the market. Despite consultants conducting market studies in 2008 and in 2012, a market review is yet to be concluded and remedies applied (although the third market review process is now underway within ICASA).

2.1.2. Telecommunication as Critical Economic Infrastructures in the NDP

As a broad overarching framework, the NDP was never intended to address these problems directly. Rather, the Diagnostic Report formed the backdrop for the telecommunications section of the NDP chapter on economic infrastructure.

The NDP, which followed the release of the NPC's Diagnostic Report in 2011, locates the ICT sector primarily within the context of the economic infrastructure required to operate an industrial economy effectively. The overall objective of the economic infrastructure chapter in the NDP is to improve and develop basic infrastructure around power, water, roads, ports and telecommunications. With this in mind, the ICT action plan prioritises the establishment of a national, regional and municipal fibre-optic network to provide the backbone for broadband access, which is driven by private investment and complemented by the public funds required to meet social objectives.

Reflecting some concerns about the narrowness of broadband definitions and e-strategies in official policies and documents at the time (and highlighted in the Diagnostic Report), the digital vision in the NDP, however, is more forward-looking. Although shoehorned into the chapter on economic infrastructure, it conceptualises telecommunications and ICT more as a critical nervous system of the emerging digital economy.¹⁷

By 2030, ICT is expected to underpin the development of an inclusive dynamic information society and knowledge economy through the development of a comprehensive and integrated e-strategy that reflects the cross-cutting nature of ICTs.

For its goals to be achieved, the NDP highlights the need for inter-governmental as well as private and public co-ordination. The NDP identifies transformative strategies elsewhere in the world (for example, South Korea) and suggests greater collaboration between the state, industry and academia as being critical to the success of any e-strategy.¹⁸

The telecommunications section of the NDP envisions an enabling role for the state, with powers delegated to a specialised regulatory institution with sufficient capacity to effectively regulate a competitive sector in line with global sectoral policy reforms and South African policy. This

¹⁷ South African Government. (2012). National Development Plan: Vision 2030. Pretoria: Government Printer.

¹⁸ National Planning Commission (NPC). (2011). National Development Plan 2030: Our Future – Make it Work (Draft Plan). NPC, Gauteng: Pretoria.

2. POLICY DEVELOPMENTS - *continued*

includes providing policy and regulatory certainty, not least of all to stimulate investment in this capital-intensive industry but also to ensure the delivery of services to those marginalised from them both historically and currently. The effective regulation of competitive markets is seen as the primary delivery mechanism of affordable access to a number of services.

The NDP refers to new means of assigning the spectrum that will become available, following the migration of terrestrial television broadcasting from analogue to digital transmission and sets out a novel strategy for universal access including targets, monitoring, and evaluation indicators. It also identifies the need for demand-side stimulation strategies, such as e-literacy, skills development and institutional development, as well as other strategies to promote ICT diffusion.

For the medium term (from 2015 to 2020), the NDP endorses the target proposed by the then DOC in Vision 2020 of achieving 100% broadband penetration by 2020. It also expands the definition of broadband from 256 kbps to at least 2 Mbps. Table 1 shows the ICT infrastructure targets for 2019. Unfortunately, in implementation (or the lack thereof), wavering on the e-strategy by the DOC, first mentioned in the Electronic Communications Act (2005), ICT was still viewed as an integrated but sectoral strategy.

Table 1: ICT Infrastructure Targets for 2019

Impact Indicators	Baseline	Proposed 2019 Target	Status in 2019
Broadband penetration	33.7%	80% at 5 Mbps 50% at 50 Mbps	53% (RIA)
Lower Internet costs – comparable with peers by 2020	0	80% of target	Mobile Termination Rate: Dropped from R1.25 (2010) to R0.13 (2018) FTR: R0.12 in 2018 and expected to drop further to R0.1 in 2019
Public and private investment in ICT network	0	+ 10%	R248 billion (IDC): Gartner: R277 billion
Public investment as a percentage of GDP	6.8%	10%	3.3% to 4.4% (StatsSA)

Sources: RSA (2012) National Development Plan, IDC, Gartner, RIA, StatsSA

2. POLICY DEVELOPMENTS - *continued*

2.2. Policy Development Since 2012

2.2.1. SA Connect

In order to operationalise the NDP, the government gazetted the national broadband policy plan and strategy, SA Connect, in 2013. Conceptualising broadband beyond infrastructure only, as it had been done in the early broadband plan in 2009, the policy attempted to lay the ground for an integrated supply- and demand-side strategy to meet the NDP's goals of a:

... dynamic and connected information society and a vibrant knowledge economy that is more inclusive and prosperous. A seamless information infrastructure will be universally available and accessible and will meet the needs of individuals, business and the public sector, providing access to the creation and consumption of a wide range of converted services required for effective economic and social participation - at a cost and quality at least equal to South Africa's main economic peers and competitors.

SA Connect hinged on the resolution of some legacy challenges for future-orientated policy, without which it was unlikely to succeed. These included the Minister being made responsible for investigating:

- the rationalisation of state-owned entities that were variously challenged or unviable as a result of ad hoc sectoral policies and the post-apartheid institutional design;
- the viability of an open-access wireless network; and
- the enhancement of public sector connectivity.

The policy identified 'structural constraints' in the sector as needing to be overcome, along with the need to satisfy demand for affordable broadband. The sharing of resources and infrastructure, including spectrum, is further depicted as a responsibility of the regulator to encourage service-based competition in the market. The implementation of the broadband plan stalled, however, resulting in the target of connecting 50% of the population at 5 Mbps average download speed by 2016, not being met. Other targets that had been prioritised, including the need to connect 50% of schools and health facilities at a speed of 10 Mbps, were also not met.

SA Connect proposed a four-pronged supply- and demand-side strategy to meet a range of short- and long-term targets. This strategy is depicted in Figure 2: SA Connect Strategy.

With the implementing agencies in disarray, the broadband policy and plan has largely not progressed. The reasons for this include the following:

- The DTSP was incapacitated by the splitting of the DOC and lack of continuity in leadership over several administrations (discussed in more detail in the next section).
- SITA was compromised by corruption in its supply chain and human capital management.
- Broadband Infracore was undercapitalised for a long time and therefore unable to compete in an increasingly competitive wholesale environment.

2. POLICY DEVELOPMENTS - *continued*

- The DTSP and ICASA were locked in litigation over responsibilities for spectrum.
- The USAASA was paralysed by intra-organisational litigation.

If the policy and broadband plan derived from the NDP and SA Connect, had been implemented from 2013, South Africa may have been in a position to address current challenges arising from the dynamic and increasingly complex digitalised and globalised environment in which it now finds itself. However, it was not, as is further explained in the implementation section below.

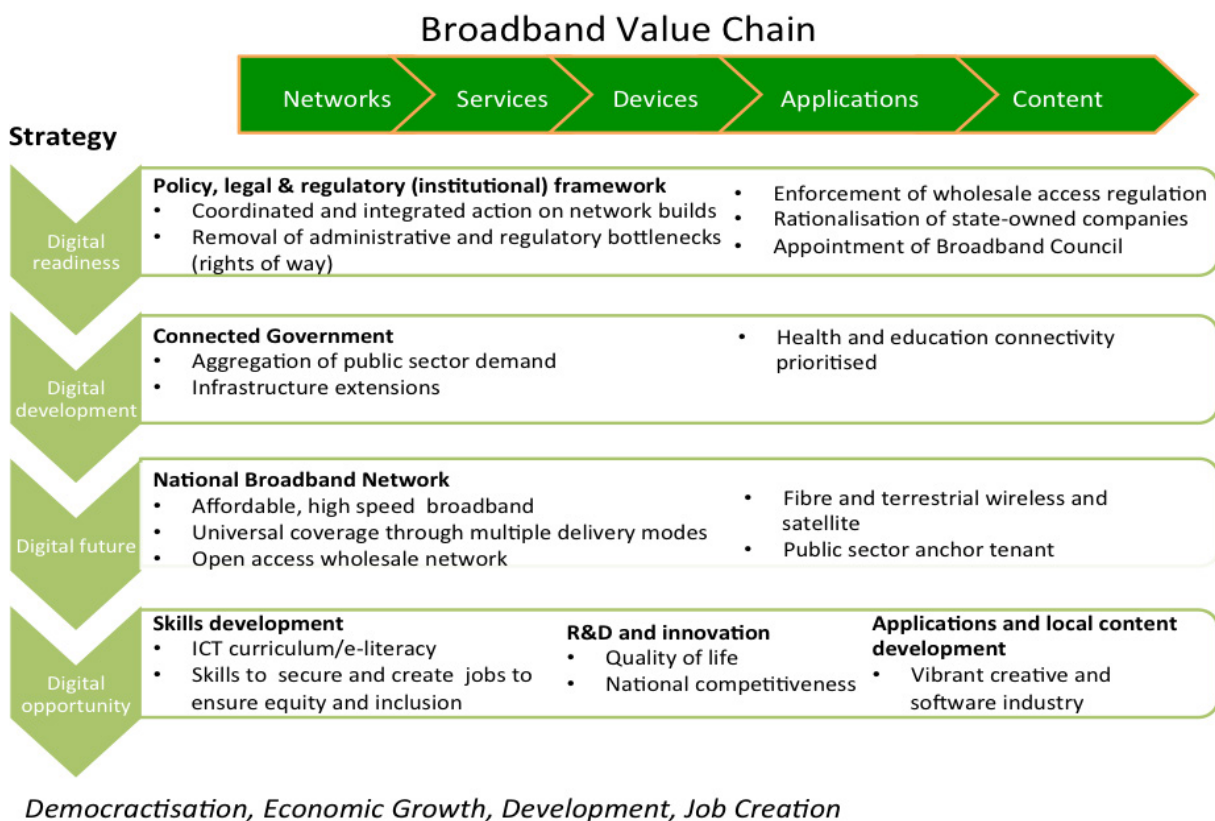


Figure 2: SA Connect Strategy

Source: Department of Communications (2013) SA Connect: Creating Opportunities, Ensuring inclusion – South Africa's Broadband Policy, Policy Brief for Cabinet.

2. POLICY DEVELOPMENTS - *continued*

2.2.2. National Integrated ICT Policy

The former DOC was split into two following the 2014 general election. This decision caused a delay in the finalisation of recommendations from the ICT Policy Review Panel, which were only formalised in late 2016. An ICT Policy Review Panel of independent experts had been appointed by Minister Pule in 2012 to inform an e-strategy, and had issued:

- a Framing Paper setting out principles to govern its work in 2013;
- a Green Paper in 2014;²⁰
- a Discussion Paper, which more closely resembled a Green Paper by canvassing options, in 2014; and
- a set of recommendations in 2015.

The National Integrated ICT White Paper, which followed some 18 months later, departs from the 2015 recommendations in several key aspects. There was concern by stakeholders in various public processes leading up to the adoption of the White Paper by Cabinet in 2016 that the consensus reached on certain issues was not reflected and, instead, was substituted by decisions that had been rejected. The White Paper sought to provide a comprehensive overview of the various outstanding policy issues in the sector, essentially to fulfil the policy requirements of the e-strategy. However, as overarching as it was, its focus remained siloed within the communications sector.

The White Paper, however, does deal with the development of converged technologies, digitisation, communication and work, as well as how South Africans use the Internet. It advocates for an inclusive and participative digital society that uses technology to bridge digital divides. It focuses on improving access to infrastructure, competition (particularly in the services market), and the inclusion of all citizens in the digital economy. Drawing on the NDP, the National ICT Policy outlines several objectives to ensure the development of a dynamic and connected information society and a vibrant knowledge economy that is more inclusive and prosperous. The Policy is underpinned by the following principles:

- **Equity:** All South Africans must have affordable access to communications infrastructure and services and the capacity and means to access, create and distribute information, applications and content in the language of their choice.
- **Accessibility:** Services, devices, infrastructure and content must be accessible to all sectors of the population, including persons with disabilities, so that all can equally enjoy and benefit from communication services.
- **Social development:** All South Africans must benefit from the ability of the ICT sector to facilitate social development and improve the quality of life for individuals and communities.
- **User protection:** End-users, from the most disadvantaged individual to the largest corporate, must be at the centre of ICT sector-related policies. Effective protection and empowerment of end-users and superior quality of service are therefore key objectives of this policy and necessary areas of regulatory intervention.

²⁰ Arguably a misnomer, as it was mainly a review of progress made.

2. POLICY DEVELOPMENTS - *continued*

The White Paper plans to abolish all the existing statutory bodies and replace them with a new economic regulator tasked to take over regulatory functions from ICASA, the domain name authority (ZADNA) and the USAASA. The proposed regulator will be answerable to the DTSP while retaining independent regulation of broadcasting and content, presumably under the rump of ICASA. In effect, this will mean a return to the pre-2000 dispensation under the Independent Broadcasting Authority (IBA) and the South African Telecommunications Regulatory Authority (SATRA). In addition to this, the DTSP will also gain centralised policymaking powers and oversight of the ICT sector, with the creation of additional committees to serve and carry out some of these functions.

The White Paper claims to provide the 'overarching policy framework for the transformation of South Africa into an inclusive and innovative digital and knowledge society'.²¹ It outlines:²²

As with SA Connect, the White Paper also drew on the NDP, highlighting human development as a central challenge. The National e-Skills Plan of Action (NeSPA) takes this into account and seeks to promote skills acquisitions in South Africa while, at the same time, providing those skills. Furthermore, South Africa's National ICT Policy Review states that the Human Resources Development Council of South Africa (HRDCSA), the e-Skills Council, the MICT Seta, Knowledge Production Hubs, and the National e-Skills Dialogue Initiative (NeSDI), were all established to prioritise skills development.

The lack of integration of skills development into existing school and tertiary training curricula echoes the focus of research funds into national research and industrial councils, with less strategic focus on leveraging the intellectual and technical capacity in independent academic institutions for national projects. The White Paper will give rise to a slew of legislation to improve the functioning of the sector and achieve its political goals:²³

- the Ikamva National e-Skills Institute Bill;
- the Postal Services Amendment Bill;
- the South African Post Office Amendment Bill;
- the Electronic Communications Amendment Bill;
- the Digital Development Fund Bill;
- the ICT Sector Commission and Tribunal Bill; and
- the Electronic Communications and Transaction Amendment Bill.

²¹ Department of Telecommunications and Postal Services. (2016). National Integrated ICT Policy White Paper. Available at: https://www.dtps.gov.za/images/phocagallery/Popular_Topic_Pictures/National_Integrated_ICT_Policy_White.pdf, p. 117

²² Department of Telecommunications and Postal Services. (2016). National Integrated ICT Policy White Paper. Available at: https://www.dtps.gov.za/images/phocagallery/Popular_Topic_Pictures/National_Integrated_ICT_Policy_White.pdf, p. 3

²³ Department of Telecommunications and Postal Services. (2017). 'Briefing on proposed legislation emanating from the National Integrated ICT Policy White paper', Robert Nkuna: Director-General, Department of Telecommunications and Postal Services, Pretoria, 10 October 2017. Available at: <http://pmg.org.za/files/171010whitepaper.pptx>

2. POLICY DEVELOPMENTS - *continued*

Of these, only the first had been tabled in Parliament at the time of writing. Drafts of two others (the Postal Services and Electronic Communications Amendment Bills) have been issued, and the public has been afforded an opportunity to make submissions. Just prior to the May 2019 elections, the Electronic Communications Amendment Bill was withdrawn.

2.2.3. Electronic Communications Amendment Bill (withdrawn)

The only Bill that brought before Parliament was the Electronic Communications Amendment Bill (2018). After an initial round of public parliamentary hearings, it was withdrawn shortly before the elections in May 2019. The reasons for this withdrawal appear to be the controversial spectrum issues and specifically the Wireless Open Access Network (WOAN), which, if legally challenged, could further delay the release of high-demand spectrum that had already missed the deadline by six years.

While there are controversial elements of the White Paper presented in the Electronic Communications Amendment Bill (see below for more detail on the open-access principle, amendments to spectrum management policy, and their overlapping in the creation of a single national wireless open-access network), it does contain a number of potential benefits for the ICT sector. Rather than identifying a single state-sponsored operator to deliver on national broadband objectives, the Paper proposes to increase competition in the service layer, in order to offer better value to end-users.

2.2.4. Institutional arrangements and implementation failure

Although the Electronic Communications Amendment Bill has been withdrawn, it still indicates the thinking of the Department in relation to key aspects of policy. The Bill sets out several fundamental departures from the recommendations of the ICT Policy Review Panel. It is clear from the White Paper that the remaining Bills referred to above will have substantial implications for the Electronic Communications Act and for the structure and regulation of the sector. It is likely that they will affect the powers, competencies and independence of ICASA, as well as the future existence and scope of USAASA and the domain name authority, ZADNA.

An undercurrent of the Bill arguably asserts the role of the DTSPS and its Minister over that of ICASA and downgrades the independence of the latter. The Bill grants extensive powers to the Minister, not only in overseeing the sector, developing policies and representing the country at international fora but also in the management of scarce resources such as spectrum. The lack of progress in implementation since 2013 can be attributed to a number of factors, including:

- poor policy decisions;
- diversion from consultative policy processes by government;
- a lack of state co-ordination required for implementation of policy;
- a lack of institutional stability and leadership continuity (a turnover of six Communications Ministers in seven years);

2. POLICY DEVELOPMENTS - *continued*

- protracted legal and regulatory processes, as well as indecision; and
- long-standing legacy policy tensions that remain unaddressed.

2.2.5. Wireless Open Access Network (WOAN)

The Bill also proposes to license a WOAN operator and sets out procedures to establish the proposed WOAN as a special licence category, with the close involvement of the Minister.

The establishment of the WOAN as an electronic communications network services (ECNS) licensee with radio frequency spectrum and subject to special conditions is intended to provide wholesale ECNS on an open-access basis to other operators licensed in terms of the Electronic Communications Act. Incentives for the establishment of the proposed WOAN include:

- reduced or waived fees;
- access to rights of way and public infrastructure, as well as public electronic communications facilities through government facilitation; and
- the allocation of funds to construct or extend an electronic communication network in under-served areas.

The Bill also specifies that the Minister must determine which unassigned high-demand spectrum must be assigned to the WOAN. In addition, its asymmetrical application may serve to disadvantage other applicants for spectrum, making it anti-competitive. Any new assignment of additional high-demand spectrum would become conditional on the WOAN being 'functional'. South Africa is already lagging behind many African countries where 4G is concerned.²⁴ Making access to 'high-demand' spectrum conditional on the successful deployment and operation of the WOAN, which already faces a number of risks, might further delay the urgent release of 4G spectrum.²⁵

While several smaller participants in the market have welcomed the proposed WOAN's potential to increase both competition and equitable access to spectrum, larger operators and industry stakeholders have condemned the approach for being heavy-handed and have cautioned against unintended outcomes, especially the negative impact on significant investment currently being made in mobile networks. Consensus seems to be emerging around the prospect of a hybrid system that accommodates government's WOAN proposal by assigning portions of available and future spectrum to it, as well as to existing operators prior to the withdrawal of the Bill.

²⁴ A 2014 study by Analysis Mason, commissioned by DTSPS and the Treasury, on the viability of the open access network indicated that there was no case to be made for the introduction of such an open access wireless network, and that evidence from those being trialled elsewhere at the time suggested caution was advisable. The DTSPS has indicated that it does have other studies that have demonstrated the viability of the 2017 decision to undertake an implementation analysis but this too has not been made public as yet. What is clear is that it was a technical analysis on what spectrum allocation would optimize the viability of the WOAN. It did not include a business plan or an economic impact assessment.

²⁵ For more on this, see: Gillwald, A., Odufuywa, F., Esselaar, S. & Rademan, B. (2017). An evaluation of open-access broadband networks in Africa: The cases of Nigeria and South Africa. Research ICT Africa, Policy Paper. Available at https://researchictafrica.net/publications/Other_publications/2016_Integrated_Policy_Paper_-_Open_Access_Broadband_Networks_in_Africa.pdf

2. POLICY DEVELOPMENTS - *continued*

2.2.6. High-demand spectrum hearings

The long-awaited release of the high-demand spectrum got underway with the call for comments by ICASA on the Information Memorandum (IM) on the licensing process for the assignment of high-demand spectrum which was released in November 2019. The IM deals specifically with the licensing of 700 MHz, 800 MHz, 2.3 GHz, 2.6 GHz and 3.5 GHz bands.

On current timelines, the spectrum auction should take place by the end of 2020 at the latest with the licensing of the wholesale open-access network (WOAN) to be concluded in 2021. If the WOAN has to be operational before the new spectrum is assigned as required by an earlier Ministerial directive the delay would severely set back the reconstruction of the post-Covid-19 economy.

The failure to release high demand spectrum has been cited by operators and analysts, not only as a factor contributing to the high cost of data in the country, as operators deploy 4G services in suboptimal bands but also as a massive opportunity cost to the country over the last decade, which runs into billions of Rands by various estimations.

The decision to include the 2.3 GHz and 3.5 GHz bands (suitable for 5G services) was somewhat surprising, especially since the plans to license the original three bands (700, 800, 2600) dated back to 2016. There had been pressure on the Ministry and ICASA earlier to separate spectrum in the 2.6GHz band. There was consensus that it would be more efficiently assigned together with the 700 and 800MHz spectrum. However,, bundled together the assignment was delayed by the failure of the country to migrate analogue broadcasting services from the 700 and 800 bands to the lower UHF bands (450 to 699 MHz) for digital broadcasting, in order to free them up for mobile use.

The inclusion of the additional 5G bands in the IM resulted in opposing views from different parties who submitted comments. The global interest in IMT 2300 and IMT 3500 is on the rise due to its potential for the deployment of 4G (LTE) and 5G networks. This spectrum is particularly interesting for the larger operators that have already deployed extensive LTE networks and had plans to migrate to 5G, which having acquired the spectrum they have now rolled out in the major centres. Although Vodacom and MTN favoured the release of spectrum in these bands, this was not a view shared by the smaller operators. Furthermore, they both support awarding it on a national basis together with Qualcomm, who argued that making it available on a regional basis would be inefficient and would deter investment.

While it might be true that Vodacom and MTN are more prepared to invest in LTE and 5G technology in these bands, the other operators fear that this move would strengthen their dominance and hinder fair competition from smaller and regional operators without the capacity for national coverage.

2. POLICY DEVELOPMENTS - *continued*

Smaller service providers, as well as the Internet Service Providers Association (ISPA) and the Wireless Access Providers' Association (WAPA), argued that the auction of IMT 2300 and IMT 2300 is premature. Some argued that if ICASA went ahead with this auction, it should be assigned to the WOAN to ensure its success. WAPA proposed, on the other hand, licensing it on a regional basis to foster investment by SMME licensees.

Some of these alternatives were addressed in the 54 submissions to ICASA early in 2020 in response to the IM released on the licensing process for the assignment of high-demand spectrum in November 2019. The IM deals specifically with the licensing of 700 MHz, 800 MHz, 2.3 GHz, 2.6 GHz and 3.5 GHz bands.

TDD over FDD

One of the few points of consensus among operators is that the 2600 MHz band should be used as Time Division Duplex (TDD) rather than Frequency Division Duplex (FDD). TDD uses the same frequency band for downlink and uplink in different time slots, whereas FDD requires two separate frequency bands and therefore twice the amount of spectrum. Only option 1, out of the five proposed in the IM, uses FDD in the 2600 MHz band, following the recommendations from the 2019 Ministerial 'Policy of High Demand spectrum and Policy Direction of the Licensing of Wireless Open Access Network' over the spectrum allocations for the WOAN. However, the Regulator seems to agree with the operators on the advantages of TDD over FDD, as it highlights in the IM that TDD would ensure more efficient allocation and avoid inter-band interference and traffic asymmetry.

2.2.7. Legacy spectrum and proposed migrations

In-band and out-of-band migration

Some of the spectrum lots proposed in the IM would require in-band and out-of-band migrations, the specifics of which are not clear. The operators affected by this have voiced their disagreement and, in some cases, demanded financial compensation. RAIN currently holds spectrum in 2570-2595 MHz, as a result of the spectrum acquired from i-burst, previously Wireless Business Solutions. The BEE licence was granted by ICASA on instruction of the Ministry (Department of Communications) around 2002, following the exclusion of aspirant black licensees from the mobile licensing process that saw the licensing of MTN and Vodacom in 1993. According to the proposed lots, it would be required to migrate to 2670-2690 MHz on options 1, 3 and 5 or to 2540-2560 MHz (out-of-band migration) on option 2.

Rain has proposed alternative allocations that would enable them to maintain their spectrum. If this cannot be accommodated, the operator demands financial compensation for the costs of exchanging equipment that they claim to have deployed in over a thousand sites across the country. The spectrum band in question is central to the Rain strategy as demonstrated by the launch of its fixed-broadband 5G network to selected users in Johannesburg and Tshwane at the end of 2019, the first in the country.

2. POLICY DEVELOPMENTS - *continued*

MTN, making implicit reference to the comparative advantage of Rain's legacy spectrum in the 3.5 GHz band, requested a cap of 80 MHz per operator for the 3-6 GHz band. Similar to Rain, Liquid Telecom expressed concerns about how the auction process will affect its rights as license holder in the 800 MHz band and warns that it would take them 18 to 24 months to complete the in-band migration.

Broadcasting digital migration

An important aspect affecting the 700-800 MHz bands is the migration of broadcasters to digital bands (450 to 699 MHz). Several submissions point to the fact that the digital migration of analogue to digital broadcasting is still pending. Five years behind international cut-off, digital migration is directly relevant to the high-demand spectrum assignment process since it would free up high-demand spectrum in the 700MHz and 800MHz bands for broadband use.

BOX 2: ALTERNATIVE LICENSING IN THE UK

Ofcom, UK's communications regulator, announced in 2019 it would reserve 390 MHz of spectrum between 3.8 GHz and 4.2 GHz for local coverage. In this scheme, anyone could apply for a 5G licence covering a small area (ca. 50 square metres) to develop their own local 5G network. Apart from that, 1800 MHz and 2300 MHz spectrum bands were also made available through local licences. Applications can be made to Ofcom for co-ordinated access to ensure no interference, on a first-come-first-served basis. The licence fee will reflect Ofcom's cost of issuing the licence. Ofcom's approach to local licences and shared access to spectrum aims to address the need for alternative spectrum for local connectivity. Where spectrum is licensed on a national basis and not being used in every location, Ofcom will allow other users to use this spectrum. It is anticipated that most spectrum will be available to share in remote areas.

2.2.8. Covid-19 Temporary Spectrum

In mid-March 2020, the Minister of Communications and Digital Technologies issued a directive to ICASA to make more spectrum available to meet the unprecedented demand for bandwidth and to alleviate large-scale digital exclusion in the country during South Africa's Covid-19 lockdown. ICASA issued a call for applications for temporary spectrum within a week. It extended the validity of existing radio frequency spectrum licences by three months and indicated its desire to see greater spectrum sharing by operators. The proviso in the regulations is that this had to be done efficiently and without compromising the quality of communication services or interfering with the functioning of existing broadcasters and operators. An important condition accompanying the rights to temporary spectrum are zero-rating of all Covid-19 related sites and creation of virtual classrooms as determined by the education department.

Only 17 out of the 35 applications for temporary spectrum, who complied with the narrow provisions of the ICASA invitation to apply, were licensed. Dominant players in the mobile market, MTN and Vodacom, received portions of spectrum in every band, with Telkom, Liquid and Rain receiving supplementary spectrum to their legacy assignments in the high demand bands. Cell C did not bid as it has a roaming agreement with MTN.

2. POLICY DEVELOPMENTS - *continued*

Table 2: Temporary spectrum assignment

BAND	OPERATOR	TEMPORARY ASSIGNMENT	PREVIOUS SPECTRUM
700/800 MHz	Telkom	40 MHz	
	Vodacom	40 MHz	
	MTN	40 MHz	
2300 MHz	Telkom	20 MHz	60 MHz
	Vodacom	20 MHz	
2600 MHz	Telkom	40 MHz	
	Vodacom	50 MHz	
	MTN	50 MHz	
	Rain	30 MHz	20 MHz
3500 MHz	Telkom	12 MHz	28 MHz
	Vodacom	50 MHz	
	MTN	50 MHz	
	Liquid Telecom	4 MHz	56 MHz

Source: ICASA 2020

With MTN and Vodacom the only players with pockets deep enough to enter the bidding, this probably does not look very different from the outcome of the auction for radio licences in these bands later in 2020. The only novel part of the temporary spectrum licence process was the licensing of three new companies to operate in the bands set aside for TV white space – a dynamic, secondary use technology able to operate in the guard bands between those set aside for broadcasting.

As part of Covid-19 measures to make more spectrum available to meet the unprecedented demand for bandwidth, ICASA has extended the validity of existing radio frequency spectrum licences by three months while promoting the sharing of spectrum by operators. The proviso is that this should be done efficiently without compromising the quality of communication services or interfering with the functioning of existing broadcasters and operators.

2. POLICY DEVELOPMENTS - *continued*

The digital dividend bands are not available for mobile telecommunications due to South Africa's failure to migrate broadcasters and operators from 700 and 800 spectrum bands. Despite the process having started in 2000, a staggering 20 years ago, South Africa failed to meet the global cut-off date of 2015 for migration set by the International Telecommunications Union (ITU), the international body responsible for international radio standards and spectrum allocations.

ICASA's regulations positively promote the use of TV white spaces by operators. White space devices are required to be type-approved prior to operation - they must meet the European Telecommunications Standards Institute (ETSI) certification requirements and support integration of a Geolocation Spectrum Database that controls availability of channels.

Regulation to enable the use of TV whitespaces (TVWS) spectrum for the rollout of data services was finalised two years ago and its deployment could play a key role in ensuring affordable access for rural areas and marginalised communities. The costs of deploying such dynamic spectrum technology and the operation of it are lower than later generation GSM technologies, precisely because they are designed to optimise spectrum use through the secondary use of spectrum or spectrum sharing. Although there are many dynamic spectrum technologies, TVWS is the only one that is standardised internationally. It has operated on a test licence in the country in conjunction with the Council for Scientific and Industrial Research (CSIR) and their Geolocation Spectrum Database. With this go-ahead on TVWS regulation, deployment could be swift.

These temporary spectrum regulations somewhat overtook the Authority's spectrum hearings on the release of high-demand spectrum, which was planned for April 2020 but is now expected to take place in November 2020.

After South Africa failed to release high-demand spectrum for over a decade, the speed with which access to temporary spectrum is being rolled out has prompted hopes that the impending assignment of high-demand spectrum will be fast-tracked, as it will be an essential catalyst to the rebuilding of the post-Covid-19 economy.

The Ministry and ICASA have emphasised that these arrangements are temporary and extraordinary and that the pre-Covid-19 status quo will be reverted to within three months after the end of the national state of disaster or by November 30th at the latest.

While the incumbent operators are clearly best placed to make use of additional spectrum more quickly to roll out services, this has resulted in those already with high speed broadband have ended up with more. Those unable to afford devices and services have not been brought online. The directive and regulations for temporary Covid-19 spectrum could have been used more experimentally by opening up opportunities for the innovative deployment of complementary technologies and services to meet the diverse needs of the country for alternative licensing arrangements, such as regional licensing of lower cost dynamic spectrum technologies using

2. POLICY DEVELOPMENTS - *continued*

secondary spectrum, community networks and lower power micro-networks able to offer niche services that address unmet needs and complement existing services.

2.2.9. ICASA

Following the separation of the DOC into the DTSP and the DOC, ICASA's line of accountability remained with the DOC. As a result, significant responsibilities and implementation accountabilities in the telecommunications sector that needed to align with telecommunications policy from the DTSP were left without a direct line to ICASA.

The departmental splitting also compounded legacy issues about the authority and autonomy of ICASA, which have long undermined its ability to implement national policy effectively. These include both structural conflicts of interest in institutional arrangements and politicised public appointment processes, which have resulted in a lack of technical competencies, governance experience and the unnecessary politicisation of the organisation. The outcome has been the highly ineffectual regulation of the sector, with a consequent absence of competitive outcomes, including efficient resource allocation or enhanced consumer welfare. Without sufficient accountability and, arguably, oversight, (together with the multi-party appointment process by the Portfolio Committee being susceptible to party politics) ICASA's legal autonomy, decision-making processes and systems have been compromised.

Weak state co-ordination and poor administrative processes have also had a negative impact on the sector. After a delay in the initiation of the appointment process after councillors' terms came to an end by the (then) Minister of Communications, existing councillors were compelled to stay on. This stasis created an interregnum in the leadership of the regulator, with an associated impact on decision-making and uncertainty for the sector.²⁶ An apparent turf war over spectrum assignment between the Ministry and ICASA, following the regulator's Invitation to Apply (ITA) for high-demand spectrum in June 2016, is an example of the institutional disjuncture that has resulted in the use of public funds by state institutions to challenge each other over matters that should be clear from the policy and law.

However, the public appointment process finally got underway and a new council was appointed in November 2018.²⁷ Issues about pending criminal charges against the chairperson of the board, who arguably should not have been appointed while the case was still sub judice, compromised the integrity of the organisation as a whole.²⁸ Parliamentary committees and Ministers responsible for the appointment of successive boards and councils that have increasingly failed to meet most basic governance thresholds, have never been held accountable for these fallouts.

²⁶ DispatchLive. (2015). DA welcomes Parliament's decision to withdraw ICASA nominations. Available at: <https://www.dispatchlive.co.za/news/2015-06-23-da-welcomes-parliaments-decision-to-withdraw-icasa-nominations/>

Parliament of the Republic of South Africa. (2017). National Assembly adopts the list of five recommended candidates to serve at the ICASA Council. Available at: <https://www.parliament.gov.za/press-releases/national-assembly-adopts-list-five-recommended-candidates-serve-icasa-council>

²⁷ Rubben Mohlaloga had subsequently been found guilty by the courts on fraud in relation to the Land Bank where he formerly worked and has taken the matter on appeal. However, he has resigned, and a new chairperson has been appointed.

2. POLICY DEVELOPMENTS - *continued*

2.2.10. Digital migration and spectrum

The failure of the broadcast digital migration process, as well as a debacle over the release of high-demand spectrum, are two of the more striking examples of what appears to be state failure that inevitably leads to wasted opportunity costs for the economy. Weak political appointments and lack of leadership have consistently plagued the DOC, DTPS, ICASA and USAASA, all of which have been paralysed by corruption, mismanagement and suspensions of senior personnel. Some of these problems relate to the erosion of ICASA's independence.

This has happened both directly through the clawback of delegated powers (most recently in relation to spectrum planning by the Ministry) and indirectly, through the politicisation of the council appointment process. Others relate to the structural conflicts of interest, which persist as a result of continued state ownership and influence in the sector. Examples include failure to implement the proposed SA Connect national roll-out plan on the basis of leveraging public and private investments through smart procurement by the public sector through open tender, as well as the decree that first Telkom (partially owned by the State) and then, when that was challenged, BBI, would be the national broadband champion, with BBI being arguably the least-viable national carrier.²⁹

The further conflation of political and economic interests around commercial opportunities within the sector, such as set-top box manufacturing or arguably spectrum policy, together with ideological rigidity or self-interest by decision-makers in some instances, have sometimes overridden the outcomes of public processes and indeed empirical evidence. This has resulted in institutions and organisations within the communication portfolio being immobilised by intra- and inter-departmental tensions and unnecessary litigation absorbing significant amounts of taxpayers' money on both sides, mostly without procedural or legal clarity in the outcome.

2.2.11. Cost of communication and affordability

Another example of the failure of state to co-ordinate efforts around reducing the cost of communication is the multiple and duplicated initiatives of various agencies to deliberate on the matter. In an effort to promote effective competition in broadband markets, Minister Siyabonga Cwele requested ICASA to undertake an inquiry and prescribe regulations to this effect in 2016.³⁰ The arduous process had only begun when the Finance Minister Malusi Gigaba directed the Competition Commission to conduct a market inquiry into the market(s) for data services in South Africa to review the high cost of data in the country – though it was instructed to do so in consultation with the National Consumer Commission and ICASA, among others. The implications

²⁹ When, as part of the rationalisation of state-owned entities, Telkom was approached to buy BBI, it offered a R1, which was rejected by the state. BBI is now to merge with Sentech whose license will allow them to offer fully-integrated electronic network services. SITA, which currently connects public buildings under the SA Connect initiative, may also be incorporated into the state-owned company. (Interviews with BBI, Sentech and SITA, 2019)

³⁰ Masweneng, K. (2017, July 17). ICASA to tackle high cost of data, Businesslive. Available at: <https://www.businesslive.co.za/bd/companies/telecoms-and-technology/2017-07-17-icasa-to-tackle-high-cost-of-data/>

2. POLICY DEVELOPMENTS - *continued*

of the finding, particularly the mandatory price reductions, are discussed further below but some of the additional efforts for make services more affordable are briefly discussed here.

The Competition Commission's instruction to mobile operators to remove the 'poverty premium'³¹ on small value, pre-paid mobile bundles is a welcomed intervention that should have been acted on by the sector regulator, the Independent Communications Authority of South Africa years ago. Pre-paid data effectively cost magnitudes of scale more than post-paid or contract data per megabyte. This is despite it being paid upfront, which logically should result in a discount. There is a further higher cost for low-volume, small value bundles that are purchased by the poor, compared to the high-volume purchases of bigger volumes that are highly discounted.

Even though this might produce minor distortions to market allocation of resources, the adjustment to the pricing is warranted on public interest grounds and is likely to have the intended outcome of making low-value bundles more affordable to the poor. However, there are other likely unintended consequences for some of the Commission's other decisions to reduce prices for the poor.

The free, 'lifeline' data package proposed by the Commission and hailed on public talk shows may not be the best way of getting services to the poor or reducing digital inequality. There is considerable evidence³² of the costs of mandatory user subsidies being transferred to end users' prices. As with the universal service obligations that accompanied the liberalisation of markets in developing countries and in South Africa, these levies are not paid from their surpluses. Instead, they are built into the cost of services driving up the price of services for users.

From a public interest policy perspective, this is justifiable if the subsidy and cost allocation is transparent and the increased cost being paid by those online is being used to subsidise the extension of network or services in order to get the rest of the population online, as in classical universal service regulation. In an ineffectually regulated market such as ours, and with our poor record of universal service levy management, there is little confidence that this would be monitored effectively and public interest transfers effected.

As the cost of targeting the needy by identifying and administering the subsidy is too costly, practically a lifeline data package means that every pre-paid SIM (85% of the data market) is given a basic amount of data. This produces a classical free-rider problem. A large number of the beneficiaries of the lifeline service who are capable of paying for the service receive the benefit. The cost of the mandatory service, as indicated above, is absorbed into the overall cost of provisioning, making it more expensive for those who are already price sensitive.

³¹ Odendaal, N. (2018). Poverty comes with a data premium – Competition Commission hears. Engineering News. Available at: <https://www.engineeringnews.co.za/article/poverty-comes-with-a-data-premium-competition-commission-hears-2018-10-17>

³² Williams, M.D.J. (2010). Broadband for Africa. World Bank. Available at: <http://documents1.worldbank.org/curated/en/684121468010226781/pdf/536430PUB0Broal01Official0Use0Only1.pdf>

2. POLICY DEVELOPMENTS - *continued*

Arguably, a public interested alternative or complementary demand-side assessed subsidy such as the provisioning of free public Wi-Fi at all public buildings, as proposed in the South African broadband plan, would enable those who were unable to pay for airtime to go online by accessing a public Wi-Fi point.

Price-sensitive feature and smartphone users are increasingly supplementing the purchases of their high-value, low-denomination bundles with public Wi-Fi. Thirty-two percent of Internet users³³ indicated that they used public Wi-Fi at least once a month, with women demonstrating greater use at 32% compared to men (30%). Of course, those who could afford data services would also be able to access the free Wi-Fi but they would need to make the effort of getting to a free public access point and not get it automatically.

Another option is zero-rating public interest services. Ideally this should be in addition to some free public Wi-Fi otherwise the poor are left with little choice - with only limited access to various non-zero-rated services. The lifeline service also favours those who are already online. Although the Commission focuses on the negative impact of data prices on consumers, and there is certainly evidence that it impacts negatively on usage (which is way below the average use of similar size economies).³⁴ The primary barrier to the 50% of South Africans not being online is because of the cost of the device.

So, although reduced data prices may enable those who are already connected through smart devices to use data more optimally and to enjoy the benefits of being connected, such as financial inclusion, information gathering and job-seeking, it does not assist with bringing the large number of people who are not connected, online.

In fact, counterintuitively perhaps, the current business model of operators that subsidises handsets through the data price and which has, in their own evidence contributed to high prices, has enabled large numbers of people that otherwise might not have been able to afford devices to come online.

2.2.12. USAASA and the Universal Service and Access Fund

As with most other jurisdictions, universal access and service policy in South Africa requires a major overhaul. Universal access and service funds have been largely unsuccessful in enhancing universal access, other than a very few exceptions that have qualified success.³⁵ The levy is an added input cost to the total cost of services (carried by the user), which is already unaffordable in many jurisdictions. The double negative impact of such funds is that, as a secondary sector

³³ Gillwald, A., Mthobi, O., & Rademan, B. (2018). The State of ICT in South Africa (Policy Paper No. 5; Series 5: After Access-Assessing Digital Inequality in Africa). Research ICT Africa.

³⁴ See AfterAccess website. Available at: <https://afteraccess.net>

³⁵ Gillwald, A., Deen-Swarray, M., & Mthobi, O. (2017). The State of ICT in Lesotho (Series 5: After Access - Assessing Digital Inequality in Africa) [Policy Paper]. Research ICT Africa. Available at: https://researchictafrica.net/wp/wp-content/uploads/2018/01/2017_The-State-of-ICT-in-Lesotho_RIA_LCA.pdf

2. POLICY DEVELOPMENTS - *continued*

tax, it may disincentivise investment in a jurisdiction. Furthermore, if this levy is not spent on its intended purpose, as is mostly the case across Africa and Asia, it simply pushes up the cost of communications, making access less affordable for the poor.³⁶

The mandate of the USAASA in the Electronic Communications Act includes its role to 'manage [the] Universal Service and Access Fund in the promotion of universal service and universal access to electronic communications services, electronic communications networks, and broadcasting services'³⁷ While its role requires USAASA to make recommendations to the Minister as to what constitutes universal service and access, the Minister has to make determinations in this regard and publish them in the Government Gazette. The Act requires USAASA to co-ordinate efforts towards universal service and access.

To do so, the Agency may undertake investigations, conduct research and surveys, and evaluate the extent to which universal service and access have been achieved in the country. The Agency is also required, when requested, to advise ICASA on universal service.³⁸

By law, the money collected for the fund is put into the National Revenue Fund Account and distributed via National Treasury appropriations. However, excluding funds earmarked for digital migration, allocations to the USAF by the National Treasury amounts to a mere R625 million,³⁹ for which there is very little of substance to show. Some R400 million was spent on telecentres, few of which remain in operation today. A further R150 million financed Internet connectivity for some public schools and further education and training (FET) colleges, and just over R60 million was spent on the failed Under-serviced Area Licensee experiment. None of these funds appear to have reached 'needy persons', the key objective of the USAF.⁴⁰

³⁶ Samarajiva, R. & Hurulle, G. (2019). Metrics to improve universal service fund disbursement, Digital Policy, Regulation and Governance. Available at: <https://www.emerald.com/insight/content/doi/10.1108/DPRG-07-2018-0035/full/html>; International Telecommunications Union. (2013). Universal service fund and digital inclusion for all study. Available at: <https://www.itu.int/en/ITU-D/Conferences/GSR/Documents/ITU%20USF%20Final%20Report.pdf>

³⁷ Electronic Communications Act 36 of 2005. Available at: <https://www.gov.za/documents/electronic-communications-act29>. More information on the repeated instances of corruption at USAASA, its failure to ensure sustainability in its initiatives, and the absence of any subsidies benefiting the needy prior to the STB debacle can be found in the 'Institutional arrangements' section below.

³⁸ Although the original Universal Service Agency was established with a sunset clause, the now renamed USAASA has been kept alive in each new round of legislation over the last two decades, despite its inability to deliver on its mandate. To an extent, the Agency's problems can be explained by the historical evolution of the sector's institutional arrangements over the past 25 years. The Electronic Communications Act (ECA) requires all licensees to contribute to the USAF in accordance with regulations issued by ICASA, which remains the body responsible for prescribing the basis and manner of contributions, although by law they may not exceed 1% of a licensee's annual turnover. As part of the convergence rationale of the ECA, the mandatory contribution to the Fund extends to broadcasting licensees, who prefer to contribute to the Media Development and Diversity Agency (MDDA). The ECA allows the minister to issue policy directions to the USAASA Board in carrying out its oversight functions.

³⁹ Funding in the USAF, earmarked for the digital migration, totals some ZAR2.25 billion to date. Lewis, C. (2015). Establishing a Local Content Fund: The Experience of Funding Universal Access and Service. Available at SSRN: <https://ssrn.com/abstract=2663055> or <http://dx.doi.org/10.2139/ssrn.2663055>)

⁴⁰ Gillwald, A., Onkokame, M. & Rademan, B. (2018). The state of ICT in South Africa. Available at: https://researchictafrica.net/wp/wp-content/uploads/2018/10/after-access-south-africa-state-of-ict-2017-south-africa-report_04.pdf

2. POLICY DEVELOPMENTS - *continued*

USAASA's management of the USAF has been undermined by instances of corruption and poor governance.⁴¹ Over the lifespan of the USAF, over R2 billion in universal service levies has been collected, almost exclusively from the telecommunications licensees but only a portion of this has been appropriated for the operation and projects of USAASA.⁴²

Based on the government's decision to subsidise the set-top boxes (STBs) required for the migration to digital terrestrial television, the National Treasury set aside R1.39 billion in the USAF's budget for the benefit of South Africa's five million indigent households.⁴³ Nevertheless, up to and including these events, there is a dearth of evidence to show how South Africa's poor have benefitted from the operations of the USAF, an institution mandated to effectively systematise the trickle-down effect for the unconnected.

Yet, besides ignoring the ICT Policy Review Panel's recommendations, the White Paper and Electronic Communications Amendment Bill⁴⁴ (which has now been withdrawn) proposes no fundamental review of the effectiveness of universal service obligations (USOs) or the USAF in achieving universal access. On the contrary, the requirement that there is ministerial 'approval on the nature and form of all universal access and universal service obligations before they are imposed on licensees appears to consolidate the existing policy.

The extension of ministerial directive powers to universal access and service specifically, which already exist in general, would effectively constitute a veto power on decisions taken by the regulator. In addition, this proposal does not address the problem, as ICASA has had little to do with the formulation or even implementation of universal access and service. Rather, the regulator is responsible for imposing the USOs (even though it has had little success with monitoring them), levying percentages, which it passes on to the National Treasury, and defining under-serviced areas.

The proposed dissolution of USAASA, as appears to be contemplated in the undeveloped Digital Development Fund (DDF) Bill, may remove some of these problems. It aims to do this by replacing the USAF with the DDF, although the mandatory contribution would simultaneously increase from 0.2% to a minimum of 1%.

⁴¹ See, for example, inter alia: Malefane, M. & Ncana, N. (2011, November 11). Digital TV officials suspended over R29m, Sunday Times. Available at: <http://www.timeslive.co.za/scitech/2011/09/25/Digital-TV-officials-suspended-over-R29m/>; Holomisa, B (2013, June 7). Corruption and Maladministration at USAASA. Open letter. UDM Website. Available at: <http://udm.org.za/corruption-maladministration-usaasa/>; Mzekandaba, S. (2017, August 7). Cloud of corruption hangs over STB tender. ITWeb. Available at: http://www.itweb.co.za/index.php?option=com_content&view=article&id=163914:Cloud-of-corruption-hangs-over-STB-tender&catid=260

⁴² See: Interview CEO USAASA, April 2019; Lewis, C. (2017). Universal access and services in South Africa: Policy success, policy failure and policy impact. SSRN Electronic Journal. Available at: https://www.researchgate.net/publication/317395971_Universal_Access_and_Service_in_South_Africa_Policy_Success_Policy_Failure_and_Policy_Impact

⁴³ MyBroadband. (2014, April 1) They're after our billions! MyBroadband. Available at: <https://mybroadband.co.za/news/government/99798-theyre-after-our-billions-usaasa.html>

⁴⁴ Department of Telecommunications and Postal Services (DTPS). (2017). Electronic Communications Amendment Bill - Draft. Available at: <http://pmg-assets.s3-website-eu-west-1.amazonaws.com/ECABill.pdf>

2. POLICY DEVELOPMENTS - *continued*

The administrative and governance costs of a dedicated agency have imposed a considerable and unnecessary financial burden on the sector that can be reduced with incorporation into the regulator. Dissolving the USAASA as a body of resources raises important questions about the distribution of existing assets and funds, as well as the transfer of responsibility for these decisions and resources.

2.3. WEF Internet for All

The other two African countries in Internet4All partnerships are Rwanda, a country with less than 10% Internet connectivity in 2017, and Uganda, with 13% Internet connectivity in 2018. In 2017, just over half (51%) of the South African population had access to the Internet. The remaining 49% of South Africans who not connected to the Internet look no different demographically to the 90% of Rwandans and Ugandans who do not have access. Arguably every other country in sub-Saharan Africa needs more assistance than South Africa to connect their citizens to the Internet.

Much like the 4IR, at the time of the launch of the Internet4All, there had been such a long policy interregnum that industry appeared to be grateful that matters digital had arisen again on the national agenda, even if the rationale for South Africa requiring WEF assistance seemed unclear. MTN agreed to provide capacity for a secretariat to organise the forums – infrastructure, relevant content, digital skills and Internet awareness, and affordability – that had been identified as critical areas for Internet adoption.

On the infrastructure side, the CSIR was commissioned to map connectivity in the country, a useful exercise critical to any government planning. They had mapped networks in 2013 for SA Connect on the basis of confidential data from operators, which had found that 90% of people were geographically located within 10 km from a point of presence (POP). Updating the fibre and mobile networks could potentially fill an important information gap in trying to identify evidence-based policy interventions based on infrastructure needs.

As has generally been the case with commissions by government, the data and findings made by the CSIR were proprietary. A positive outcome of this review process would be if the map, even in aggregated format, is made publicly available.

The mapping is a protracted process that is expected to be completed in 2020 according to the CSIR.⁴⁵ Rather than creating the enabling environment for the growth of the ICT sector and the creation of an inclusive digital economy, the policy and regulation (and often its absence) has created uncertainty in the sector.

⁴⁵ Interview: Lucas Gumbi and Kobus Roux, Meraka Institute CSIR, 15 April 2018

2. POLICY DEVELOPMENTS - *continued*

This has produced mixed outcomes – or what the World Bank previously and perhaps more usefully referred to as ‘analogue complements’ for delivering digital dividends.⁴⁶ The next section assesses these outcomes in terms of the key supply- and demand-side policy indicators. The following section provides an assessment of the supply- and demand-side of the telecommunications landscape in South Africa. Thereafter, the last section will provide a broad identification of the preconditions and enablers that a cross-cutting digital policy would need to include and the current activities that have been identified that would require integration and co-ordination for South Africa to develop an organic national digital policy as a developing country that is increasingly integrated into the global economy.

⁴⁶ World Bank. (2016). World Development Report 2016: Digital Dividends. Washington DC: World Bank. Available at: www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2016/01/13/090224b08405ea05/2_0/Rendered/PDF/World0developm0000digital0dividends.pdf

3. MARKET OVERVIEW

The South African telecommunications market continues to be one of the most developed and advanced on the African continent despite the decade-long implementation delays in the policy and regulatory environment. The market appears to have been sufficiently mature and resilient to have withstood a bleak economic environment and both policy lags and implementation failures over the last decade while transitioning to next-generation environments.

However, without the enabling environment needed for competition and innovation and the implementation of the integrated infrastructure plan leveraging public and private investments proposed in SA Connect over the last five years, digital development has been suboptimal.

Public and private networks have developed unevenly, with some areas regarded as uneconomic for dominant business models to service resulting in those remaining unconnected – other than the limited roll-out initiatives by USAASA⁴⁷ and BBI⁴⁸ under the SA Connect banner and successful community networks,⁴⁹ though not yet on scale. The South African telecommunications market remains structured around dominant vertically integrated incumbents who, despite horizontal licences, continue to compete downstream in the services market.

3.1. Fixed line sector

Telkom continues to provide the bulk of the country's backbone network, providing backhaul services to itself and most other operators. Although the functional separation of Telkom⁵⁰ required by the Competition Commission following findings of anti-competitive practice had constrained Telkom's behaviour, the voluntary structural separation of Telkom in 2014 in response to the competition being faced from wholesale open-access carriers had a far more significant impact on the market.

Arguably more important, the transparency this separation brought to Telkom's practices and pricing enabled it to compete more effectively, retaining and growing its market share and winning back customer trust. The CEO of Telkom, Siphon Maseko, believes that the structural separation of Telkom from its wholesale facilities provider, now called Openserve, contributed to making the company more transparent.

⁴⁷ Interview: Lumko Mtinde, USAASA CEO, April 2019

⁴⁸ Interview: Phatang Ngereyane, BBI, April 2019

⁴⁹ Interview: Carlos Rey Moreno, January 2019

⁵⁰ Note that referring a case to the Competition Tribunal is the second step after it goes through the Competition Commission. This particular case began in 1999. For more information, see: Vorster, G. (2012, August 7). Telkom fined R449m for market abuse, Business Tech. Available at: <https://businesstech.co.za/news/general/19539/telkom-fined-r449m-for-market-abuse/>

3. MARKET OVERVIEW - *continued*

Its retail division used to ride on the top of the network business where the real value was created and more independently accounting for their productivity and profitability.⁵¹ Openserve has grown the business extensively with the network now consisting of 157 400 km of fibre⁵² – magnitudes of scale greater than even the combined networks of the other operators.

Although a subsidiary of Telkom, BCX, its enterprise business, is an important component of providing a full turnkey solution to its customers. BCX is one of the biggest digital end-to-end service providers for medium to large enterprises. In 2018, BCX's revenue was estimated to be R21.2 billion, which reflected a decline of 4.6% when compared to the previous year mainly due to the weak and volatile economic landscape that the country is experiencing.

Neotel's late entry into the market in 2006 as the second national operator was accompanied by high expectations of change to the communications landscape in South Africa by its introduction of affordable and high-quality telecommunications services as stipulated by the Electronic Communications Act. Although Neotel kept its promise in developing the communications sector, most of its investment focused at building the communications infrastructure in South Africa. Neotel built a national network, which included investments in metropolitan fibre networks, wireless networks, and a new network in the Western Cape. Neotel was also involved in landing the SEACOM, EASSy and WACS cable systems, building two 3-tier data centres in the country and offering innovative enterprise services.

However, given the failure of regulatory entities to support and create a fair and competitive market, Neotel struggled to penetrate the consumer market that was already seeing extensive fixed-line substitution for mobile services. In 2016, although it was approved by ICASA and the Competition Commission, Vodacom walked away from its bid to acquire Neotel for R7 billion due to concerns raised by MTN and Cell C at the Competition Tribunal as well as the order from the North Gauteng High Court to ICASA to withdraw Neotel's operating and spectrum licenses from the agreement. This unsuccessful merger was soon followed by the acquisition of Neotel by Liquid Telecom in 2017, which made it a significant player on the African continent.

3.2. Mobile communications sector

South Africa has a vibrant mobile market that has seen rapid uptake and unexpected innovations, which far surpassed market expectations when the first two licences were granted in 1993. The dominant operators are MTN and Vodacom (in terms of SIMs and voice minutes), with Cell C and Telkom Mobile trailing behind. All operators are increasingly being forced to find innovative ways of distinguishing themselves from their competitors to gain and retain customers, as they deal with the presence of disruptive over-the-top (OTT) services and the migration of their core business from voice to data. Vodacom is the largest operator in South Africa with a subscriber base of 41,3

⁵¹ Interview: Siphon Maseko, Telkom CEO, 15 April 2019

⁵² Telkom Group Interim Results, 30 September 2018. Available at: http://www.telkom.co.za/ir/apps_static/ir/pdf/financial/pdf/Interim30sep2018.pdf

3. MARKET OVERVIEW - *continued*

million, corresponding to 45.6% of the market.⁵³ Vodacom was the first operator in South Africa to launch 4G LTE technology in 2012.

As of 2018, the company claims to have extended its 4G network coverage to some 80% of the population, with 3G now reaching 99.97% of the population, and only 0.03% of the population having no coverage. Despite the investment made in 4G networks, only a small proportion of Vodacom subscribers (16%) are connected via LTE. The majority of Vodacom subscribers in South Africa are connected either through W-CDMA (44%) and GSM (40%).⁵⁴ MTN, the second largest mobile operator (measured by active SIM cards), started its transition from 3G to 4G in 2012 with the capacity to offer speeds of 70 Mbps, although at that time it could only provide average download speeds of between 7 and 20 Mbps.⁵⁵

The MTN subscriber base of active SIM cards stands at 29 806 000, representing a market share of 31%, some way behind Vodacom. The majority of its subscribers (72%) use the 3G W-CDMA network, with 18% on GSM and only 10% connecting via LTE⁵⁶ despite the fact that MTN claimed that it had 80% of 4G population coverage in 2018. MTN's 3G population coverage is reportedly 98%, marginally less than that of Vodacom. MTN Enterprise business is also a significant player in the data management and enterprise solutions market with revenue of R13.4 billion for 2018.⁵⁷

The entry of Cell C in 2001 increased competition in the South African market, which previously consisted of the MTN and Vodacom duopoly. As of 2018, 17 years later, the company has managed to gain 17% of the total market share of active SIMs, claiming some 16.3 million subscribers and doubling the company's market share since 2011. Cell C's business is highly dependent on the provision of mobile virtual network operators (MVNOs) on its network, which contributed R370 million to its revenue.⁵⁸ The majority of Cell C subscribers (72%) connect via 3G W-CDMA technology and a mere 7% use 4G LTE technology.⁵⁹ Telkom's mobile arm entered the market as '8ta' in 2010 and by 2020 emerged to become the third largest mobile operator. Its strategy to leverage the fixed-line market presence and backhaul facilities of Telkom have started to have impact. After a very slow start in the market, Telkom's strategy to reduce its cost base and sustainably introduce low data prices have built some market share with the company gaining the largest number of subscribers in 2016/17.⁶⁰

⁵³ MyBroadband (2020, May 16). Mobile subscribers in South Africa - Vodacom vs MTN. MyBroadband. available at: <https://mybroadband.co.za/news/cellular/352043-mobile-subscribers-in-south-africa-vodacom-vs-mtn-3.html>

⁵⁴ GSMA Intelligence (2018), closed database.

⁵⁵ McLeod D, MTN launches commercial 4G network, TechCentral, 30 November 2012. Available at: <https://techcentral.co.za/mtn-launches-commercial-4g-network/36673/>

⁵⁶ GSMA Intelligence (2018), available on subscription

⁵⁷ Business Tech (2019, March 7). MTN delivers strong earnings and customer growth. Business Tech. Available at: <https://businesstech.co.za/news/mobile/303936/mtn-delivers-strong-earnings-and-customer-growth/>

⁵⁸ Cell C Annual Report Presentation for year ended 31 December 2017. Available at: https://www.cellc/static-content/PDF/ANNUAL_RESULTS_2017.pdf

⁵⁹ GSMA Intelligence (2018) closed database.

⁶⁰ Mthobi, O. (2017). South Africa data prices static for two years but consumers not flocking to cheapest product offering. Research ICT Africa Policy Brief No. 3. Available at: https://www.researchictafrica.net/docs/SA%20Policy%20Brief_V16_Final.pdf

3. MARKET OVERVIEW - *continued*

Virgin Mobile has operated as a MVNO since it came into the market with some fanfare in 2006. However, the services have not been able to attract large audiences on the brand alone, with offerings that are not very competitively priced or products that are not very innovative. Virgin Mobile has less than 1% of market share, a penetration that has grown little in the 12 years of its existence. Since 2018, South Africa has seen a growth in the MVNOs subscriber base. In 2018, there were 1.7 million subscribers representing 1.8% of the total mobile market.⁶¹ The MVNO market includes PnP, MRP Mobile, Me & You Mobile, Afrihost, FNB Connect and Standard Bank Mobile, among others. Rain, a data-only mobile network, launched its services in 2018 with flat-rate offerings (R0.05 per MB) intended to incite competition in the data market where high pricing for out-of-bundle data has been the subject of consumer dissatisfaction. It has also compelled the other operators to start offering data-only contracts. The protectionism afforded state-owned entities and the advantages of incumbency, together with delays in ex ante regulation required to create an enabling environment for new entrants, are some of the factors likely to affect South Africa's digital readiness.

3.3. Backbone network and backhaul services

One example of the industry finding ways around the policy blockages and regulatory delays is in the area of fibre. The roll-out of dark fibre, initially by Dark Fibre Africa during the interregnum between the end of Telkom's exclusivity period and the introduction of fixed-line competitors, led the way for the rapid opening-up of the fibre market, which had been delayed by Telkom while it amortised its ADSL services.

While other operators waited for clarity on self-provisioning by network operators that were previously required to acquire facilities from Telkom, alongside the delayed licensing of the second network operator, Neotel, and the intended open-access national broadband company, Broadband Infraco, the network laid dark fibre that was ready to be lit by the other network and service licences, as soon as legal clarity was obtained. This laid the groundwork for fibre competition at municipal level but also later in long-haul transmission.

The co-build by MTN, Vodacom and Neotel (now Liquid), called the National Long Distance (NLD) network, was prompted by delays to the licensing of Broadband Infraco. By the end of Telkom's exclusivity period, BBI was to have provided the mobile and service providers with untethered access to an open-access wholesale national broadband network at a fraction of what it would have cost them to provide it themselves but the licensing delays prevented this from happening.⁶² Initially, the NLD network consisted of the Mtunzini/Durban/Johannesburg route, followed by a triangle-shaped route between Johannesburg, Kimberley and Bloemfontein.

⁶¹ Business Tech (2018). South African mobile market share: Vodacom vs MTN vs Cell C vs Telkom. Business Tech. Available at: <https://businesstech.co.za/news/mobile/266423/south-african-mobile-market-share-vodacom-vs-mtn-vs-cell-c-vs-telkom/>

⁶² McLeod, D. (2017, September 5). Liquid Telecom plans further SA fibre builds, Tech Central. Available at: <https://techcentral.co.za/liquid-telecom-plans-sa-fibre-builds/76816/>

3. MARKET OVERVIEW - *continued*

There is now also a leg connecting Bloemfontein and Cape Town, built along the N1 highway. Together, these are known as the NLD 1-4 routes.⁶³ The construction of the NLD 5 and NLD 6 routes, from Cape Town to Durban along the coast via Port Elizabeth and East London, started in 2017.⁶⁴ Broadband Infracore together with Sentech and SITA has been designated by the government to be the lead agency for SA Connect. With Sentech's extensive satellite backhaul and microwave spectrum, BBI's focus is on fibre roll-out. The company has very little metro fibre, most of which is leased from Liquid, Transnet, Telkom and Dark Fibre Africa.

SA Connect has added to BBI's existing mandate by extending rural reach. It requires BBI to roll-out fibre to connect 1 000 public points, of which it has completed 300. The roll-out is based on the core network, the leased and owned fibre, with microwave backhaul and access network offered through a tender process by various service providers (TWK, Brighthouse, Sentech and MTN).

Telkom continues to have the largest network by far, with over 157 400 km of fibre. The main transmission routes between the big centres are extensively duplicated by the NLD joint builds by MTN, Vodacom and Liquid, as are the routes between the metros. Dark Fibre Africa has 10 000 km of fibre, which it has been steadily rolling out for over a decade.

FibreCo, though considerably smaller, also made complementary investments, focusing on the Eastern Cape (with Convergence Partners). FibreCo, which also provides connectivity between the East African Submarine Cable System (EASSy) and the West African Cable System (WACS), was acquired by SEACOM, the first competitor to the monopoly SAT3 undersea cable in 2018, consolidating SEACOM's position as a terrestrial as well as an undersea cable company. In addition to all the major fibre operators being in the big metros of Cape Town, Johannesburg and eThekweni, fibre-to-the-home (FTTH) operators have emerged in the wealthier residential areas.

Vumatel, a pioneer in this area, has not extended much beyond Johannesburg and Cape Town, where it competes with a number of FTTH providers including Octotel, Frogfoot and Cape Connect.

3.4. Undersea cables

One of the major drivers of market growth over the past decade has been the influx of undersea cables that connect South Africa to the rest of the world. This has sent international bandwidth prices, once the primary component of Internet costs, into freefall. Table 3 provides a summary of the current infrastructure status in South Africa, followed by an overview submarine cable, fixed network and mobile network infrastructure, and last mile access network.

⁶² Gillwald, A., Odufuwa, F., Rademan, B., & Esselaar, S. (2016). An Evaluation of Open Access Broadband Networks in Africa: The Cases of Nigeria and South Africa (Policy Paper Series 4: Broadband for Africa). Available at: https://researchictafrica.net/publications/Other_publications/2016_Integrated_Policy_Paper_-_Open_Access_Broadband_Networks_in_Africa.pdf

3. MARKET OVERVIEW - *continued*

Table 3: Summary of ICT Infrastructure in South Africa

SUBMARINE CABLES	DOMESTIC BACKBONE	ACCESS NETWORK
South Africa has six submarine cables that connect the country to the rest of the world, with more than 10 terabytes of capacity.	Open Serve ⁶⁵ has deployed 157 400 km of fibre nationally, having passed 2.6 million premises passed <ul style="list-style-type: none"> • 356 684 homes passed⁶⁶ • 2.2 million fibre to the cabinet passed 	It is estimated that South Africa's metropolitan network is close to 27 000 km of fibre across the main metro areas.
West African Cable System (WACS), Africa Coast to Europe (ACE), SAT-3, SAFE, SEACOM and Eastern Africa Submarine System (EASSy)	<ul style="list-style-type: none"> • Liquid Telecom⁶⁷ has access to 70 000 km of cross-border, metro and access fibre network spanning 15 countries across Africa. • In South Africa, it is estimated that Liquid Telecom owns close to 12 000km of fibre. 	Mobile operators (Telkom, Neotel, Vodacom, MTN, Cell C) and Dark Fibre Africa have been identified as having deployed fibre in the metropolitan areas.
Submarine landing stations are located in Mtunzini in KwaZulu-Natal and in Melkbosstrand and Yzerfontein close to Cape Town.	Broadband Infraco ⁶⁸ has invested in fibre networks comprising of 14 960 km in South Africa	It is estimated that South Africa has close to 20 500 km of fibre in the last mile. Access to connectivity in the last mile is possible via the following technologies: <ul style="list-style-type: none"> • DSL: Telkom • 2G, 3G, 4G and LTE: Vodacom, MTN, Cell C, Telkom • Fibre: Telkom, Vumatel, Fibrehoods, Frofoot and Octotel.
	Dark Fibre Africa owns 10 000 km of fibre in addition to Vumatel's 8 000 km of fibre.	
	It is estimated that South Africa has over 60 000 km of unduplicated fibre and over 80 000 km of duplicated fibre; this is a result of backhaul investment made by the mobile operators (MTN, Vodacom, Cell C and Telkom).	

3.5. Pricing

The price of mobile voice and data services is a key indicator of the level of competition in the communications sector and is a starting point for assessing the sector's performance and consumer welfare. The RIA Mobile Pricing (RAMP) index is used to assess data-pricing competition in South Africa.

⁶⁵ Telkom Integrated Report, 31st March 2018. Available at: http://www.sharedata.co.za/data/006966/pdfs/TELKOM_ar_mar18.pdf

⁶⁶ Telkom Group Interim Results, 30 September 2018. Available at: http://www.telkom.co.za/ir/apps_static/ir/pdf/financial/pdf/Interim30sep2018.pdf.

⁶⁷ Broadband (2018). The quiet giant shaking up South Africa's telecoms market. Available at <https://mybroadband.co.za/news/telecoms/263801-the-quiet-giant-shaking-up-south-africas-telecoms-market.html>

⁶⁸ ITWeb (2018). Broadband Infraco, Angola Cables join force. Available at: <https://www.itweb.co.za/content/DZQ58vVJ5KNvzXy2>

3. MARKET OVERVIEW - *continued*

In 2018, following innovations and the development of new products in the market, RIA extended its pricing database to capture prices of 100 MB, 500 MB and 1 GB data with a daily, weekly or monthly validity. While the 1 GB bucket is calculated based on the cheapest offering, the prices of the new products are captured as they appear in the market, which is a critical task that helps regulators and policymakers make evidence-based competition policies.

As a result of duopoly legacies in the highly concentrated mobile market, together with the ineffectual regulation of them, there is evidence of minimal pricing competition among operators, with none of the consumer welfare outcomes associated with effectively regulated competition. The 1 GB prices in South Africa have remained constant for more than nine quarters, since Q3 of 2015. This lack of competition in the market has a particularly negative impact on low-income users who cannot access the Internet due to high data costs. Despite Telkom offering the cheapest 1 GB data at a price of R99 between Q3 of 2015 and Q3 of 2018, its low pricing strategy did not lead to any improvements in market shares.

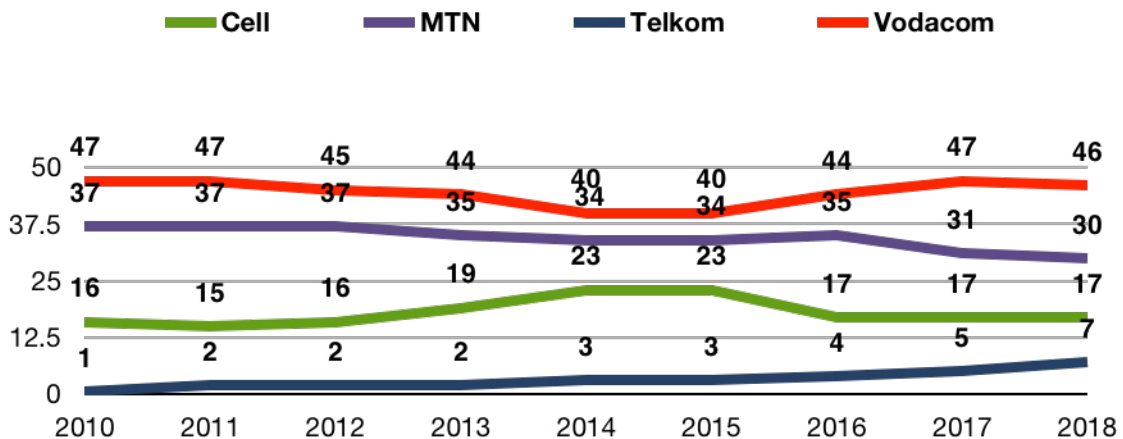


Figure 3: Operators' market share 2010–2017

Source: GSMA Intelligence, 2018

By 2020, Telkom managed to expand its market share to become the third largest mobile operator. Telkom's strategy to cut costs and introduce sustainably low prices helped turn its fortunes around and gain market share. Even with its price increase for 1 GB to R100 in Q3 2018, Telkom still had the lowest mobile data prices. At the same time, Vodacom and MTN continued to adopt flat pricing strategies, pricing 1 GB of data at R149.

The strategy to embrace OTTs at a time when the two dominant operators, MTN and Vodacom, were lobbying decision-makers against OTTs, allowed Cell C to grow its market share significantly. Cell C's market share rose to 23% in 2014/15. However, in 2016, their market share fell to 17% due

3. MARKET OVERVIEW - *continued*

to the large operators' decision to also embrace OTTs. Cell C was able to hold on to its 17% market share up to the end of 2018.

Although there is evidence that consumers do not react to price changes made by small operators, the pricing data and information on the evolution of market shares show that consumers responded to changes in prices made by the two large operators. Through its innovative products 'Just 4 You' and its promotional package that offers 2 GB at a price of 1 GB, Vodacom continues to gain substantial market share from other operators in the market.

Responding to the Vodacom pricing pressure in Q1 of 2018, MTN substantially reduced its prices to match those of Cell C and Vodacom. However, in Q3 of 2018, Telkom increased its 1 GB data by R1 to R100 but still remained the cheapest operator in the market (Figure 4).

The new, flat-rate offering of R0.05 per MB by a new mobile data network entrant, Rain, is likely to bring about changes to the data market. Although the extent of these changes is difficult to predict, Rain's strategy of using a flat rate means that customers do not have to worry about restrictive validity periods and out of bundle charges. With this strategy, Rain now offers the cheapest tariffs across the board: a 100 MB bundle will cost a customer R5, significantly less expensive than the previously lowest R29 for a 100 MB offering by Cell C, MTN and Telkom.

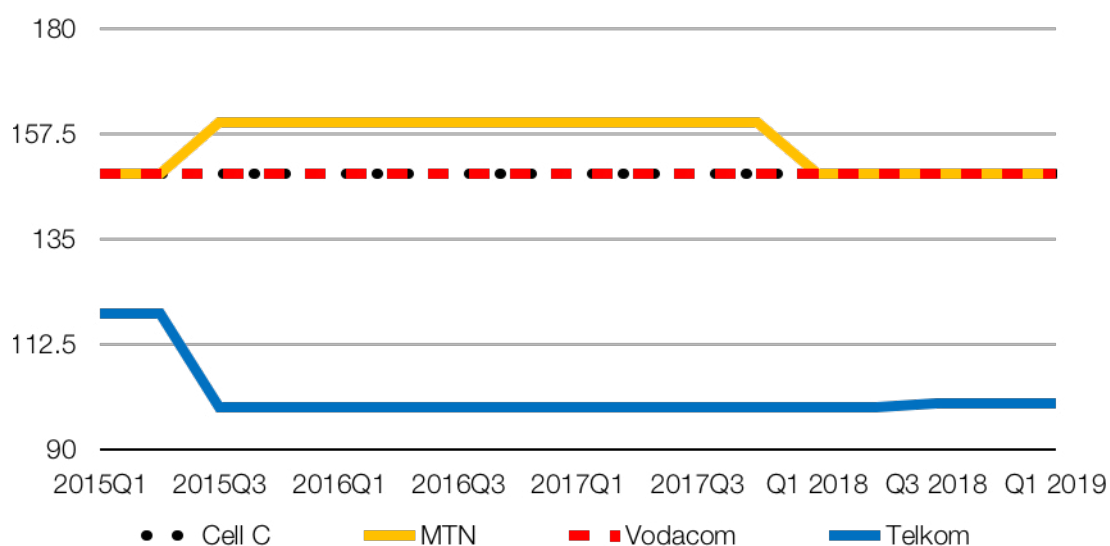


Figure 4: 1 GB prepaid mobile data prices for South African operators

Source: RIA RAMP Index, 2019

3. MARKET OVERVIEW - *continued*

Rain's 500 MB costs less than half that of Telkom's 500 MB bundle and out-competes its 1 GB bundle price too by being just about half the cost (R50). While it was expected that the competitive pricing strategy adopted by Rain would pressurise the other operators to reduce their data price for fear of losing market share, evidence from the RAMP index shows otherwise.

Rain's performance and its ability to enhance competition is limited by the fact that its coverage is limited to urban areas and that it is a data-only network, which can only be accessed by LTE-enabled devices. South Africa's mobile data prices are very high compared to other African countries. The cost of the cheapest 1 GB of mobile data in South Africa was USD6.96 (R100) in the third quarter (Q2) of 2019. Telkom Mobile offered the cheapest 1 gigabyte (GB) of data at a local price of R100 (USD6.96), R1 higher than the price submitted in Q3 of 2018. This places South Africa 32nd out of 46 African countries on the RAMP index in the first quarter (Q2) of 2019 (Figure 5).

3.6. Fixed data prices

The fixed broadband subscriber base increased by 60% in 2017. The DSL Internet subscriptions increased by 37%, with fibre-to-the-home/building Internet subscriptions and other fixed (wired) broadband subscriptions registering the largest growth of 524% and 379% in the same year respectively.

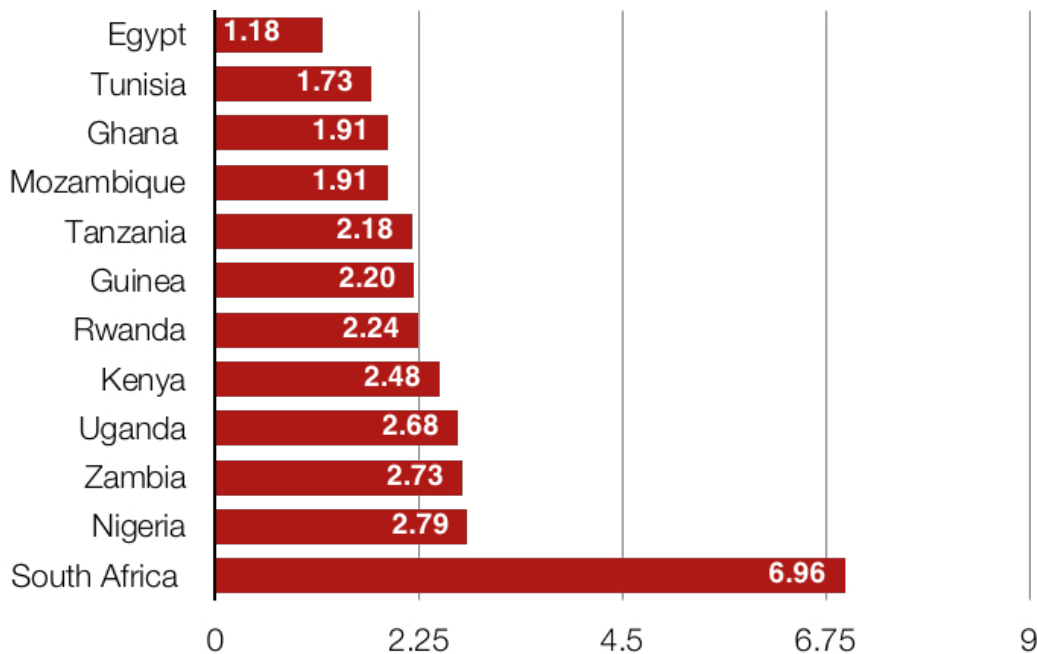


Figure 5: SA's cheapest prepaid mobile 1 GB basket compared to Africa's top performers (USD)

Source: RIA RAMP Index, 2019

3. MARKET OVERVIEW - *continued*

The Syrian Arab Republic is ranked in the first position with a price of USD1.74 for unlimited monthly fixed data at a speed of 0.3 Mbps, while the most expensive unlimited data is from Central African Republic, at USD487.35, also with a speed of 0.3 Mbps. South Africa performs worse than Mauritius (5), Seychelles (51), Tunisia (58) and Egypt (69). Based on a purchasing power parity (PPP) measure, South Africa ranks 111th out of 172 countries for 1 GB, with a price of USD45.13 (PPP) for 1 GB fixed data cap at 1.0 Mbps.⁶⁹ Cote d'Ivoire offers the most value for money, with 500 GB a month for USD31 but in terms of affordability, its prices remain relatively high at 26% of the gross national income (GNI) per capita. South Africa and five other African countries, Mauritius, Seychelles, Gabon, Cape Verde, and Botswana are the only countries with fixed broadband prices that are lower than 5% of GNI per capita.

Table 4: ICT Services

SERVICES	SUBSCRIPTIONS
DSL Internet subscriptions	2 4343 555
Fibre-to-the-home/building Internet subscriptions	280 097
Other fixed (wired) broadband subscriptions	308 697
Satellite broadband subscriptions	31 363
Terrestrial fixed wireless broadband subscriptions	84 588

Sources: *MyBroadband 2018 figures provided by ICASA*⁷⁰

⁶⁹ International Telecommunications Union. (2017). ICT Prices 2017. Available at: https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2017/IPB2017_E.pdf

⁷⁰ MyBroadband. (2018, March 29). How many fibre, DSL, and wireless subscribers there are in South Africa? MyBroadband. Available at: <https://mybroadband.co.za/news/broadband/254233-how-many-fibre-dsl-and-wireless-subscribers-there-are-in-south-africa.html>

3. MARKET OVERVIEW - *continued*

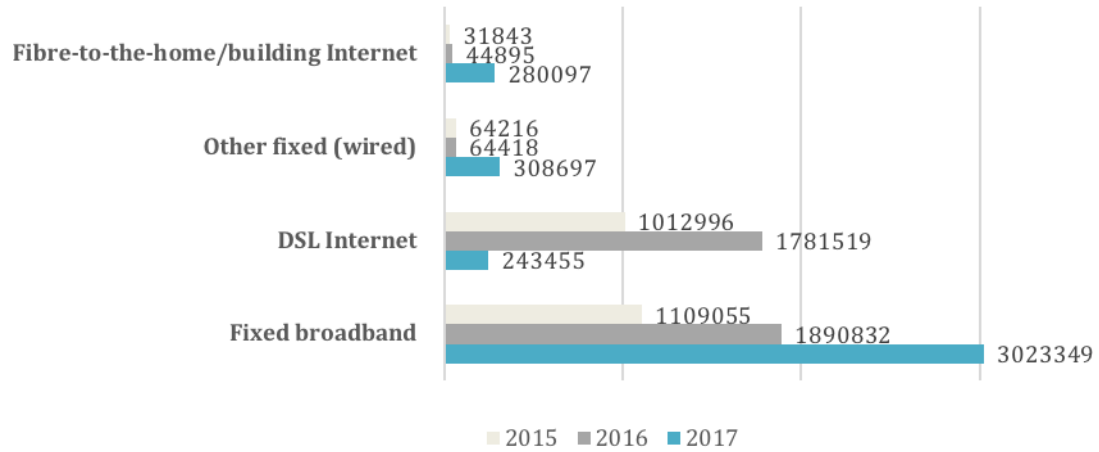


Figure 6: SA's fixed broadband subscribers

Source: Mybroadband, 2018⁷¹ (figures provided by ICASA)

3.7. Voice prices and interconnection

First movers historically used mobile interconnection rates as a competitive strategy to lock subscribers into their network. High interconnection rates/termination rates make it very expensive to make off-net calls. Studies⁷² done by a number of regulatory authorities, have shown that first movers or dominant operators use termination rates to lock customers into their networks as a means to improve competition among networks and reduce switching costs in a number of African countries including South Africa.

3. MARKET OVERVIEW - *continued*

Table 5: South Africa's Fixed Broadband Prices Compared with other African Countries

COUNTRY	PRICE (USD)	PRICE (USD PPP)	MONTHLY DATA CAP	SPEED IN MBPS
Mauritius	2.81	5.13	2 GB	0.5
Seychelles	15.11	22.78	3 GB	1.0
Tunisia	4.61	11.24	Unlimited	4.0
Egypt	4.99	20.51	10 GB	1.0
Gabon	24.03	70.75	Unlimited	5.0
South Africa	18.29	45.13	1 GB	1.0
Algeria	14.62	43.76	Unlimited	1.0
Cape Verde	9.93	21.09	5 GB	12.0
Morocco	10.09	23.64	Unlimited	4.0
Botswana	26.61	56.21	Unlimited	0.5
Namibia	33.92	83.47	Unlimited	0.5

Source: ITU ICT Prices 2017 ; Source: Saicom, 2019⁷³

The development of fixed-line broadband in South Africa has long been hampered by the lack of fixed-line infrastructure in rural and semi-rural regions, as well as by the poor quality of networks in those urban areas where they are concentrated. As discussed above, mobile networks provide the principal platform for broadband connection both in South Africa and the rest of Africa.

⁷¹ MyBroadband. (2018, March 29). How many fibre, DSL, and wireless subscribers there are in South Africa? MyBroadband. Available at: <https://mybroadband.co.za/news/broadband/254233-how-many-fibre-dsl-and-wireless-subscribers-there-are-in-south-africa.html>

⁷² Stork, C. & Gillwald, A. (2014). Link between termination rates and retail prices in Namibia, Kenya and South Africa, Telecommunications Policy, Volume 38, Issues 8–9, September 2014, Pages 783-797, Elsevier, Pergamon. Cost models and pricing framework for ICT services in Botswana, Interim Report prepared by InterConnect Communications. ICASA. (2014), "Call termination regulations" Pursuant to Section 67(8) of the Electronic Communication Act No.36 of 2005, As Amended, ICASA General notice

⁷³ Woolf, K. (2016, February 15). The Interconnect Rate and its Importance in South Africa's Telecommunications Market, Saicom. Available at: <https://www.saicomvoice.co.za/interconnect-rate-south-africa/>

3. MARKET OVERVIEW - *continued*

Lack of infrastructure is not only a factor leading to a low uptake of fixed-line services but also high connection and service prices. Using a monthly sub-basket price for a minimum monthly data allowance of 1 GB for a minimum advertised download speed of 256 kbits/s, South Africa is ranked 105th out of 195 countries, at a price of USD18.29. As a means to improve competition among networks and reduce switching costs, a number of African countries, including South Africa, adopted a glide path in termination rates.⁷⁴

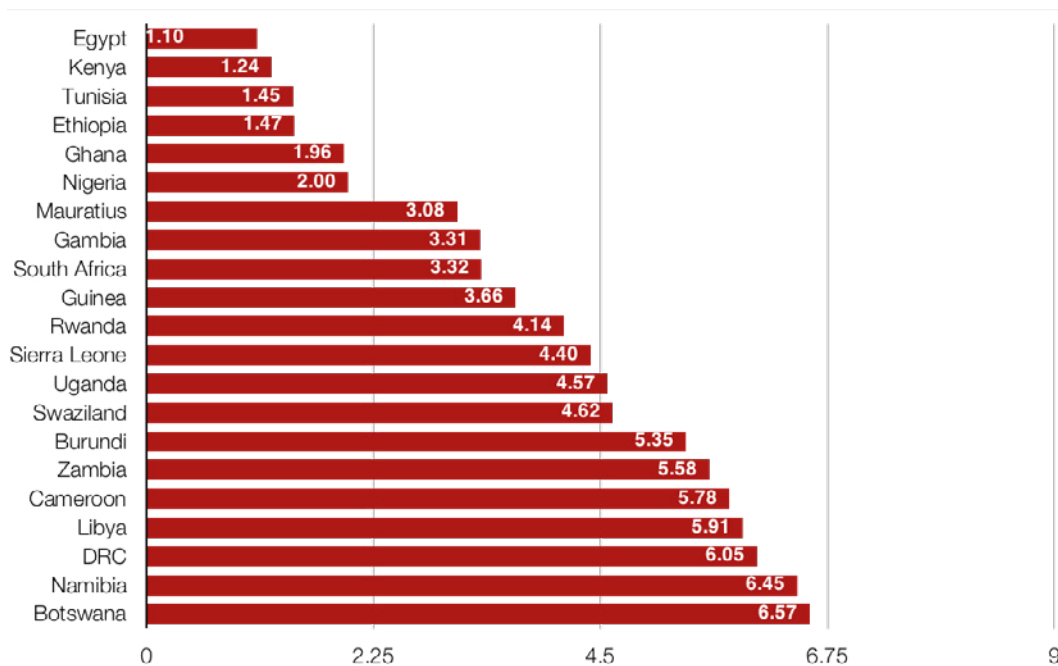


Figure 7: RAMP Voice/SMS comparison

Source: RIA RAMP Index, 2019

The glide path in termination rates led to an increase in competition for the periods 2013 and 2015. As of 2015 Vodacom, the largest operator, lost some market share to smaller operator Cell C. Vodacom's market share was reduced to 38% from 50% in 2011, while Cell C's market share moved from 13% in 2011 to 25% in 2015.

Competition within mobile operators was disrupted by the entry of over-the-top (OTT) services, which allow subscribers to make voice calls and send texts via the Internet. These services have made the termination rates policy obsolete.

⁷⁴ Mothobi, O. (2017). https://www.econrsa.org/system/files/publications/working_papers/working_paper_662.pdf

3. MARKET OVERVIEW - *continued*

However, evidence shows that dominant operators in the voice market are able to leverage their revenue to improve their network quality in the data market. At a cost of USD 3.32 for a voice/SMS monthly bundle, South Africa performs well in the RAMP voice/SMS index in Q2 of 2019, ranked in position 8 out of 42 African countries. Egypt offers the cheapest voice/SMS bundle at a price of USD1.10, followed by Kenya at USD1.24, Tunisia (USD1.45), Ethiopia (USD1.47), Ghana (USD1.96) and Nigeria (USD2.00). The most expensive voice/SMS bundle is offered by Morocco (USD31.47). South Africa performs worse than Nigeria, Ghana and Kenya but performs better than Sierra Leone, Burundi and Zambia (see Figure 7).

4. GLOBAL INDICES

While using a country's ranking on ICT indices as a basis for policymaking or evaluation⁷⁵ could present problems, long-standing indices such as the ITU's ICT Development Index (IDI) do provide a useful indication of performance in relation to other countries over time.

They also sometimes enable the identification of areas of weakness or strength. However, such indices fail to explain the root cause of specific areas of weakness, making it impossible to identify specific recommendations beyond generalised statements. Indeed, most so-called 'best practice' guidelines tend to be underpinned by assumptions of mature markets, capacitated institutions, and educated and employed populaces. While these are some of the reasons why telecom reform in Africa has tended to have uneven outcomes, global indices generally fail to provide such nuanced insights.

4.1. South Africa's Ranking

Most ICT indices seek to measure digital developments in respect of ICTs between countries over time. With all these indices seeking to measure the evolution of different aspects of digital developments relating to ICTs, South Africa's consistently poor performance is disconcerting. The country has steadily slid down all of these global indices: it was ranked 92nd out of 176 countries in the ITU's 2017 IDI; 65th out of 139 countries in the Network Readiness Index (NRI); 22nd out of 58 countries on the Affordability Drivers Index (ADI); 90th out of 163 countries on the Mobile Communications Index; and 27th out of 75 countries on Economist Intelligence Unit (EIU)'s 3i index.

When compared to countries of similar economic status, South Africa performs well in the infrastructure development indices but poorly in the demand-side indices, including Internet usage, skills and digital awareness. It performs marginally in the NRI, a more comprehensive measure comprising four sub-indices built up from 53 individual indicators but is only second to the best-performing African country, Mauritius. South Africa is nonetheless quite significantly ahead of fellow African states such as Rwanda, Tunisia, Cape Verde and Kenya.⁷⁶ These rankings provide some insights into the challenges facing the country as well as into how changes in country scores may demonstrate progress or deterioration. However, changes in a country's rankings have less to do with the ICT sector than with GDP per capita, which is not something ICT regulators on their own can do much about. When plotting indices against GDP per capita, for example, the result is typically that more than 80% of the variation in index scores is explained by GDP or GNI per capita.⁷⁷

⁷⁵ Van der Spuy, A. (2014, December 4). Online freedoms: All relative? LSE Media Policy Project (blog). Available at: <https://blogs.lse.ac.uk/mediapolicyproject/2014/12/04/online-freedoms-all-relative/>.

⁷⁶ For a more comprehensive analysis, see: Gillwald, A., Mothobi, O., & Rademan, B. (2018). The State of ICT in South Africa (Policy Paper No. 5; Series 5: After Access-Assessing Digital Inequality in Africa). Research ICT Africa. Available at: <https://researchictafrica.net/publication/state-of-ict-in-south-africa/>

⁷⁷ Gillwald, A., Mothobi, O., & Rademan, B. (2018). The State of ICT in South Africa (Policy Paper No. 5; Series 5: After Access-Assessing Digital Inequality in Africa). Research ICT Africa. Available at: <https://researchictafrica.net/publication/state-of-ict-in-south-africa/>

4. GLOBAL INDICES - *continued*

Table 6: Reduction in Termination Rates

START DATE	END DATE	MOBILE		FIXED REGULATED		FIXED	
		REGULATED	ASYMMETRY	LOCAL	NATIONAL	LOCAL	NATIONAL
01/03/13	28/02/14	0.40	0.44	0.19	0.12	0.13	0.21
01/03/14	30/09/14	0.20	0.44	0.12	0.16	0.13	0.21
01/10/14	30/09/15	0.20	0.31	0.12	0.15	0.18	0.21
01/01/15	30/09/15	0.16	0.24	0.11	0.12	0.15	0.16
01/10/16		0.13	0.19	0.10	0.10	0.15	0.12

Source: Saicom, 2019 ⁶⁹

Similarly, affordability indicators may change not because of price fluctuations but because of changes in GDP per capita, something over which ICT policymakers and regulators have little control.

The effect of well-designed regulatory interventions may be bolstered, masked or derailed by other economic events, including currency exchange rate fluctuations and the consequent impact on GDP per capita. While policymakers can therefore use indices to monitor the overall progress or regression of their particular country in comparison to others, they must look at individual indicators (rather than composite indices) to identify the sector-specific determinants of problems or successes.

As these are global indices, they all rely on the ITU for their core data. ITU data is largely dependent on supply-side data provided by the operators to country regulators or Ministries. This data is submitted to the ITU, often unaudited or not properly checked and containing patchy information that is often collected at different times. The data that the ITU receives is then cleaned and supplemented before it is published in ITU's Facts & Figures, usually two years after collection. In a dynamic ICT market, outdated data is not necessarily reliable for comparative purposes and may not be the best basis for policy formulation and planning.

4. GLOBAL INDICES - *continued*

Table 7: South Africa's Performance on ICT Indicators Related to Other Indices' Rankings

COUNTRY	RANKINGS					ICT INDICATORS		
	IDI (ex 176)	NRI (ex 139)	ADI (ex 58)	MCI (ex 163)	3i (ex 139)	1 GB prepaid data USD	Active SIM cards per 100	Internet subscribers per 100
South Africa	92	65	22	90	39	8.28	147	54
Nigeria	143	119	13	125	45	5.00	83	26
Kenya	138	86	30	116	51	2.94	82	26
Ghana	116	102	26	113	49	2.24	128	35
Namibia	118	99	31	128	N/A	5.9	99	31
Rwanda	153	80	21	134	63	2.39	75	20
Tanzania	165	126	39	136	57	2.25	72	13
Uganda	152	121	32	145	64	2.77	55	22
Sources	ITU, 2017	WEF, 2016	A4AI, 2017	GSMA, 2017	EIU, 2017	RAMP Index (Q4 2017)	ITU, 2016	ITU, 2016

Source: Adopted from Esselaar, Gillwald and Stork, 2017

Arguably more concerning is the reliance on supply-side data that does not provide an accurate picture of unique subscribers and is not disaggregated data by sex, location, income or education, which are important data points required for policy formulation and planning. In pre-paid mobile markets, operators' data measures only active SIM cards in a market.

Even in markets that legally demand SIM card registration, the data produced is notoriously imperfect, as there are still large numbers of unregistered or 'pre-registered' users, and in instances where registration does take place, it does not match the actual user. After Access⁷⁸ surveys indicate that individuals often have and use multiple SIM cards as part of their access and affordability strategies.

Demand-side surveying needs to represent users' dynamics nationally, and thus the survey requires to obtain accurate data that can be disaggregated. However, descriptive indicators reported at the national level in an aggregated manner can disguise national inequalities, especially around gender, location, income and education levels. With this level of information at hand, critical intersectional aspects of digital inequalities can be unveiled.

4. GLOBAL INDICES - *continued*

4.1.1. Demand-side assessment

Although South Africa's Internet penetration levels compare well with other African and Asian developing countries, it does not perform as well when compared to countries in Latin America with similar incomes. The nationally-representative After Access survey found that South Africa has the highest mobile phone (84%) and Internet penetration rates (53%) among the surveyed countries.

These national figures hide digital inequalities that mirror the structural inequalities in the country. As Figure 8 shows, mobile phone penetration and Internet use is broadly aligned with GNI per capita. Figure 9 shows that the gap correlation with the GNI per capita is also broadly accurate for gender-gap analysis. While digital inequalities at first appear to be gender inequalities, modelling of the data shows that they reflect underlying inequalities in access to education and income between men and women. Education and income, therefore, are the main determinants of access and use of mobile phones and the Internet.

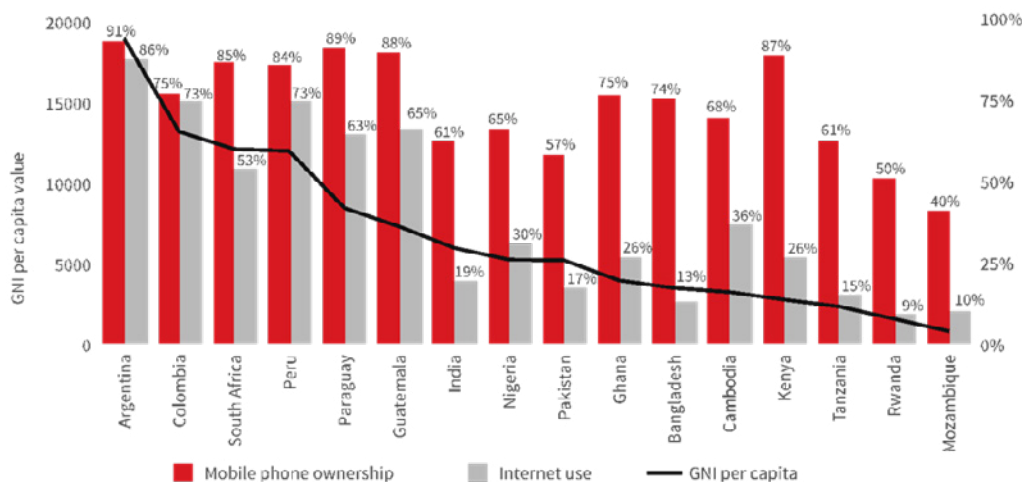


Figure 8: Mobile phone and Internet penetration, overlaid on GNI per capita

Source: RIA After Access survey data, 2017; World Bank, 2017

⁷⁸ The After Access Survey was undertaken in 2018 and 2019 in 17 countries across the Global South, and identifies the levels and type of digital connectivity, as well as barriers faced by persons 15 years or older.

4. GLOBAL INDICES - *continued*

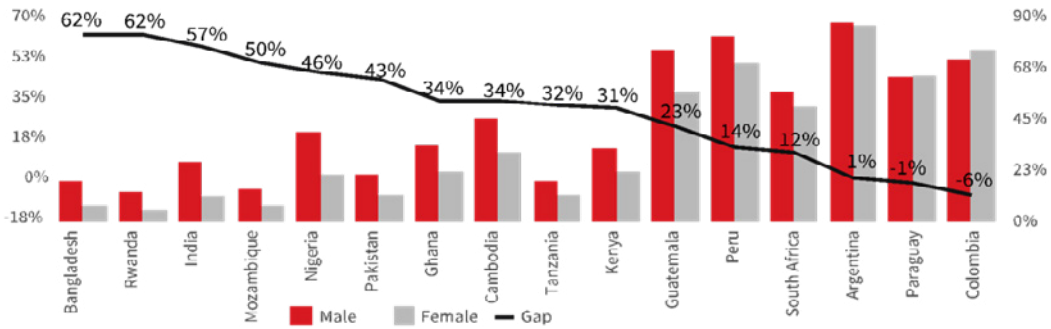


Figure 9: The gender gap in Internet use

Source: RIA After Access Survey, 2017

Although GNI per capita masks extreme income, affordability and location inequalities in South Africa, the country performs well in relation to gender equity. Men and women with similar education and income levels broadly access and use the Internet in similar ways.

Digital inequality is even higher among urban and rural area dwellers than between men and women, with less than half of South Africa's rural population being connected to the Internet. The portion of urban-based South Africans using the Internet is as high as that cited in the 2017 Stats SA Household Survey (Figure 10). Naturally, women in rural areas, with low levels of education and income, are likely to be the worst off.

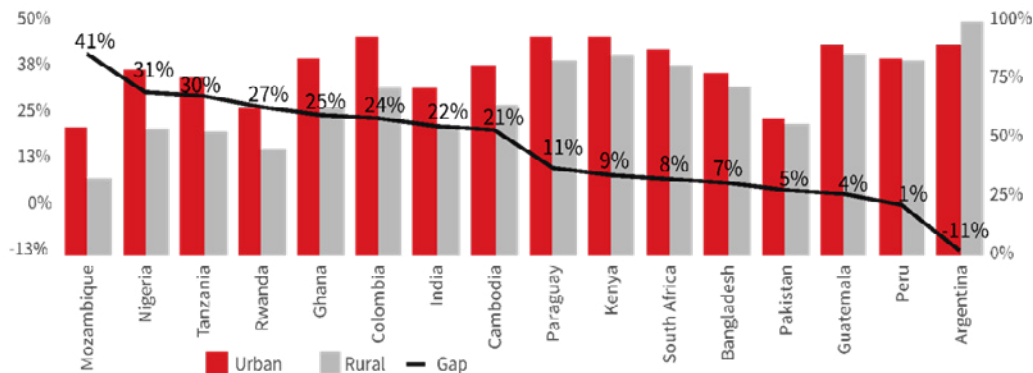


Figure 10: The urban-rural divide in Internet use

Source: RIA After Access Survey, 2017

4. GLOBAL INDICES - *continued*

4.2. Benchmarking South Africa's policy outcomes

A benchmarking exercise enables a country to be compared to countries with similar characteristics. In this case, South Africa can be benchmarked against the larger and more dynamic telecommunication markets in sub-Saharan Africa: Ghana, Kenya and Nigeria.

As values for different indicators derive from different quantitative and qualitative systems and are often not reducible to a single figure or value, the concept of a traffic light was deployed in order to indicate the relative status of the country on a particular indicator (together with a descriptor of the benchmark used to assess the status). The points requiring policy intervention are then more evident at a glance:

The colour 'green' is used as an indication of a performance that is better than the benchmark available – a national figure or triangulation of documents, stakeholder interviews and indicators, or the benchmark average – on that particular indicator.

The colour 'amber' or yellow is used to signify a performance that is average or not moving swiftly in a negative or positive direction but which will alert policymakers to the need for improvement. The colour 'red' is used to indicate performance that is below the benchmarked countries or best performers in terms of what is required as a threshold for digital readiness, or to indicate that the country is on a downward trend from a once-positive position. This identifies an indicator that needs immediate attention and intervention.

As discussed, Internet penetration correlates significantly with per capita GNI. On the other hand, most indices intrinsically link Internet penetration to GDP, which at least partly explains South Africa's position in relation to poorer-performing African countries. For this reason, South Africa is also compared to similar economies in Latin America, using the demand-side data from the 2017 After Access study. It must be noted, however, that without the supply-side data that RIA has for Africa, a fully comprehensive benchmarking exercise cannot be undertaken.

4.2.1. Infrastructure, coverage and intensity of use

Coverage obligations constitute a significant cost for operators but as markets shift from voice to data, high levels of investment in LTE and fibre become a critical aspect of competitive success. Sufficient network coverage requires extensive investment, supported by fair competition, which provides an incentive for mobile operators to invest in infrastructure.

An analysis of coverage should measure both the extent and quality of infrastructure available in a country. The extent of infrastructure is measured by network coverage and the percentage of the population that has access to a mobile signal. The quality of infrastructure, in turn, is measured by the number of subscribers per base transceiver station (BTS). This assessment includes the

4. GLOBAL INDICES - *continued*

extent of fibre in the country, and the availability of international bandwidth and cross-border connections. The level of investment is further expressed as investment per subscriber.

According to the ITU, South Africa remains the continent's leader as far as coverage is concerned. The country is connected to four high-speed undersea cables: Seacom, EASSy, WACS and ACE. This has boosted broadband capacity and shifted the bandwidth bottlenecks in South Africa from the international leg to national backbone capacity. International transmission prices are 20% of what they were in 2006, when Seacom broke the SAT-3-SAFE undersea cable monopoly in South Africa. However, today, national transmission constitutes a significant portion of the costs of service providers.

Table 8: Benchmarking South Africa against Ghana, Kenya and Nigeria on Infrastructure

INFRASTRUCTURE	COUNTRY-LEVEL INDICATOR	TRAFFIC LIGHT	COMPARISON AVERAGE
International bandwidth per user (kbps)	15 298	●	147 630
Percentage of population covered by 3G/4G signal	70.66	●	100%

Source: ITU, 2016, 3i, 2018

This highlights why it is important for ICASA to resolve and finalise its Chapter 10 market review and inquiry into dominance in the market. The inability of service providers to access wireless networks at cost-based prices prevents them from bringing pricing pressure to bear in the mobile service provision market.

The overall result is that the end-user price of mobile data in South Africa is high, as indicated by the RAMP index (Figure 11 below). Without the completion of a formal market review and assessment of dominance in the wholesale market, along with the necessary costing study, how much above cost the retail pricing is will remain unclear.

After its data price inquiry, the Competition Commission determined that mobile retail prices need to be reduced by at least 25%. However, costs of business in the country and compliance with the regulatory environment also needs to consider the coverage and quality of service requirements attached to licences and the investments that have produced some of the highest-quality networks in the country. This has increasingly become a critical competitive issue as the market shifts from voice to data, and particularly in the retention and attraction of consumers.

4. GLOBAL INDICES - *continued*

4.2.2. Access

Access is defined by a set of indicators that reflect the prevalence of mobile devices as well as Internet use. Basic phones can only connect to networks that provide access to voice and SMS services but smartphones or Internet-enabled devices can connect the user to the Internet, or to parts thereof. Smartphones are more expensive than basic phones, and are often not affordable for the poor, as demonstrated in RIA's demand-side analysis.

The RAMP index shows that local prices are high, with South Africa coming 35th out of 49 African countries in terms of 1 GB of data in Q4 of 2017. However, the benchmarking exercise shows that the majority of South Africans have access to communication services. This is rare by African standards. South Africa performs well in all access and use indicators against the other countries benchmarked in Africa - a result that is linked to its high per-capita income levels. Internet penetration levels track GNI per capita, as can be seen in Table 9: Benchmarking South Africa against Ghana, Kenya and Nigeria on Access.

Table 9: Benchmarking South Africa against Ghana, Kenya and Nigeria on Access

ACCESS	COUNTRY-LEVEL INDICATOR	TRAFFIC LIGHT	COMPARISON AVERAGE
Mobile phone ownership	85%	●	76%
Individual using the Internet	53%	●	28%
Fixed-lines per 100 inhabitants	8%	●	1%

Source: RIA After Access Survey, 2017

Modelling undertaken on the data from the After Access survey confirms that demand for telecommunications services is driven significantly by income and education level. It also shows that the overall GNI per capita masks the level of income inequality in the country. Even though South Africa performs well in this measure, there is evidence that communications services are not affordable to the majority of South Africans at the bottom of the pyramid. This is further reflected in the comparison of South Africa with Latin American countries that have similar levels of GNI per capita. South Africa does not perform well against any of the benchmarked Latin American countries, including Colombia, Guatemala and Paraguay, despite these countries having a lower GNI per capita, as shown in Table 10. An analysis of the Herfindahl-Hirschman Index (HHI), which measures market concentration, shows that there is effective competition in the Latin American countries.

4. GLOBAL INDICES - *continued*

Table 10: Benchmarking South Africa against Argentina, Colombia, Guatemala, Paraguay and Peru on Access

ACCESS	COUNTRY-LEVEL INDICATOR	TRAFFIC LIGHT	COMPARISON AVERAGE
Mobile phone ownership	85%	●	85%
Individual using the Internet	53%	●	73%
Land-lines per 100 inhabitants	8%	●	26%

Source: RIA After Access Survey, 2017

All of the benchmarked countries have HHI values ranging between 2,800 and 4,100. Argentina and Peru are the most competitive markets, with HHI index values of 3,309 and 2,806, respectively and high Internet penetration levels of 86% and 73%, respectively. This result suggests that markets that are more competitive offer more affordable prices and are more likely to be Internet-inclusive. In comparison, South Africa has high HHI values and communication services are unaffordable for many of those still offline. For those who are online, cost often constrains the extent (duration and type of data) of their use.

Among the seven African countries surveyed by RIA in 2017, South Africa still performs best, with an Internet penetration of 53%. However, the survey shows an income divide: the 47% of the population without Internet access are low-income earners. The results are evident that even though the telecommunication industry is well developed, the outcome of traditional universal access policies focusing primarily on supply-side interventions create only some of the necessary conditions for access. Unaffordability, lack of local content and the lack of skills are some demand-side barriers that limit meaningful access and contribute to digital inequality.

4.2.3. Use

The usage indicator measures the consumption of mobile services such as mobile voice and the Internet. It also assesses the intensity of use as an important determinant of digital (in)equality. The average bandwidth use of the population can be determined by dividing aggregated traffic or bandwidth figures for the country by the size of the population. This measure masks inequalities in use between Internet users with high or low intensity of use. The average bandwidth for those who are connected does, however, provide some indication of the intensity of use in the country, which is determined by the other indicators assessed here: price, quality of service, and so on.

Content remains a difficult indicator to assess due to the global nature of the Internet. Supply-side, big data analysis by global platforms can demonstrate what national traffic is going to which

4. GLOBAL INDICES - *continued*

websites but understanding the reasons why users go to specific sites can only be ascertained from demand-side data. The extent of local content, and the use made of it, is difficult to determine without such data.

Although there are limitations to this measure, local content is assessed in the benchmarking exercise by the number of Facebook users in a country, since the social media platform is largely defined by users' contributions in locally-generated content. Average revenue per user (ARPU) is an important metric for the performance of the mobile telecommunications sector. However, careful consideration is required when using this indicator. In mobile voice markets, as they move from inception towards saturation, ARPUs start off high, as high-income early adopters come online but decrease as the 'long tail of low-income users' comes online, and the average usage drops accordingly.

With blended ARPU, voice ARPU declines but data ARPU increases, as higher-end users' demand increasingly consumes data-intensive video products. As more users who cannot afford to use data intensively come online, ARPU tends to decline. The other problem with this indicator in prepaid mobile markets is that the measure is not per unique subscriber but per active SIM card. With the phenomenon of multiple SIM-ownership in many markets, ARPU becomes very diluted. Since the introduction of OTT service providers, mobile operators are increasingly adopting strategies aimed at protecting their voice and SMS market, which has higher margins than data traffic, in order to increase their ARPUs. In this context, a lower ARPU would mean low-end users are coming into the market and making greater use of OTT voice and text services.

Table 11: Benchmarking South Africa against Argentina, Colombia, Guatemala, Paraguay, Peru on Usage

USAGE	COMPARISON AVERAGE	TRAFFIC LIGHT	COUNTRY-LEVEL INDICATOR
Average revenue per user in USD (blended ARPU) per month	7,85	●	6,87
Highest minutes of use (MoU) per connection	221 (Colombia and Peru)	●	131
Data traffic	195 345.12(TB) (Peru-smartphones)	●	81 649.96 (TB) (smartphones)
Social media users per 100 inhabitants	75%	●	45%

Source: GSMA, 2017, *RIA After Access Survey, 2017

4. GLOBAL INDICES - *continued*

Compared with the other benchmarked countries, South Africa's SIM penetration rates are high. As more low-end, marginal users enter the market, ARPUs should decline. The benchmarking exercise, however, shows that ARPUs in South Africa are higher, an indication that South Africans are spending more on communication services.

However, according to the 2017 After Access Survey, 46% of those who use the Internet state that the price of Internet access limits their use – a result that shows that the high ARPU in South Africa is mostly driven by high prices. The effect of high prices in the usage of communication services is also evidenced when South Africa is benchmarked against Latin American countries. South Africa performs poorly in all usage indicators against these countries.

The use of social media and data traffic is high in Latin American countries compared to South Africa: Smartphone data traffic in Peru is more than twice that in South Africa, and the average social media use in the Latin American countries is also more than twice that in South Africa, resulting in low ARPUs in these countries. This is further evidence that prices and competition are critical drivers of communication services, with more competitive markets likely to have higher adoption rates and greater intensity of use of communication services.

4.2.4. Pricing and affordability

A key component of achieving universal access and usage service is affordability. Whether or not telecommunication services are affordable depends primarily on the price (which is determined by the input costs and profit margin of the operator) and the user's disposable income.

While the mobile voice and SMS market have matured and prices are steadily declining as consumers demand more Internet services, the mobile data market is far more volatile. In countries where both voice and data services prices are high, there are usually significant obstacles deterring increased access to communications services.

4. GLOBAL INDICES - *continued*

Table 12: Benchmarking South Africa against Ghana, Kenya and Nigeria on Affordability

AFFORDABILITY	COMPARISON AVERAGE	TRAFFIC LIGHT	COUNTRY-LEVEL INDICATOR
Mobile prepaid voice basket (USD)	2.13	●	3.86
Dominant operator: mobile prepaid voice basket (USD)	2.66	●	6.46
Mobile prepaid 1 GB basket (USD)	3.04	●	7.27
Dominant operator: mobile prepaid 1 GB basket (USD)	4.06	●	10.84

Source: RIA After Access Survey, 2017

South Africa's cost of communication is high when compared to other African countries. The cost of 1 GB of data in South Africa is double the average cost of the same amount of data in the comparative countries. Lack of competition is one of the factors contributing to high prices, and although there are some mobile virtual network operators (MVNOs) present in the country, the mobile market is still dominated by four MNOs, a number that is half the number of MNOs in Brazil and Nigeria (eight MNOs each) and fewer than the number in Cambodia (five MNOs), and Ghana (seven MNOs).

The 2017 RIA After Access Survey shows that low-income earners in South Africa pay a significantly higher proportion of their disposable income to access telecommunication services than in the benchmarked countries. The affordability divide between low-income and high-income South Africans is creating connection barriers for low-income earners, especially as the country has significant income disparities. The survey shows that almost 50% of South Africans do not use the Internet. The unconnected 50% of the population are all at the bottom of the pyramid – evidence that the price of communications in South Africa is unaffordable to the poor (see Figure 11).

Other than creating a barrier to access and use, the cost of communication in South Africa discourages users from accessing the Internet as much as they need or desire to, even when they own or have Internet-enabled devices. A quarter of Internet users in the country stated that the cost of Internet access limits their Internet use.

4. GLOBAL INDICES - *continued*

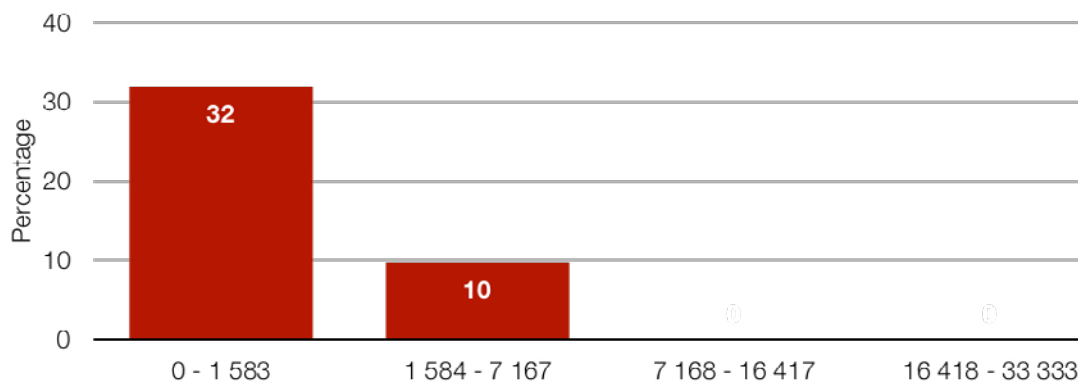


Figure 11: Percentage of individuals who do not have access to the Internet, by income group (ZAR)

Source: RIA After Access Survey data, 2017

4.2.5. Quality of service

With increasing demand across the continent for video content, streaming media, and services such as cloud computing, broadband performance, how users experience performance becomes increasingly important to competitive outcomes in the market.

In order to meet the demand for high-usage bandwidth applications, South African operators have invested extensively, increasing capacity through investing in both terrestrial fibre networks and in the provision of mobile LTE networks. Despite this increase in network capacity, the speed gap between various countries remains very wide,⁷⁹ as the five fastest countries have download speeds that are about 40 times faster than the five slowest countries. Of the 39 African countries ranked in a Cable Index, none achieved average broadband speeds above 10 Mbps, with South Africa ranking 80th out of 189, having a mean download speed of 4.36 Mbps.

The research, however, focuses on fixed-line broadband tests, which tends to put African countries at a greater disadvantage due to fixed infrastructure challenges, and hence slower speeds. In 2013, researchers found that ADSL – which is slower and more expensive than mobile broadband connections – was the predominant form of fixed-line connectivity in the country. Since then, market conditions might have changed somewhat due to FTTH increasingly being available in some higher-end suburbs and metros.

⁷⁹ See: <https://www.cable.co.uk/media-centre/release/New-Worldwide-Broadband-Speed-League-Unveiled-UK-Ranks-31>. The Index is based on M-Lab data.

4. GLOBAL INDICES - *continued*

As far as quality of service is concerned, South Africa performs well in comparison to other African countries. In addition, as a result of download speeds in the proliferation of FTTH and relatively high levels of investments in fibre by MNOs, Figure 12 shows that there has been an ongoing improvement in download speeds in South Africa from Q2 of 2014 to date, a development that can be associated with investments by telecommunication providers as they try to out-compete each other regarding coverage, speed and quality.

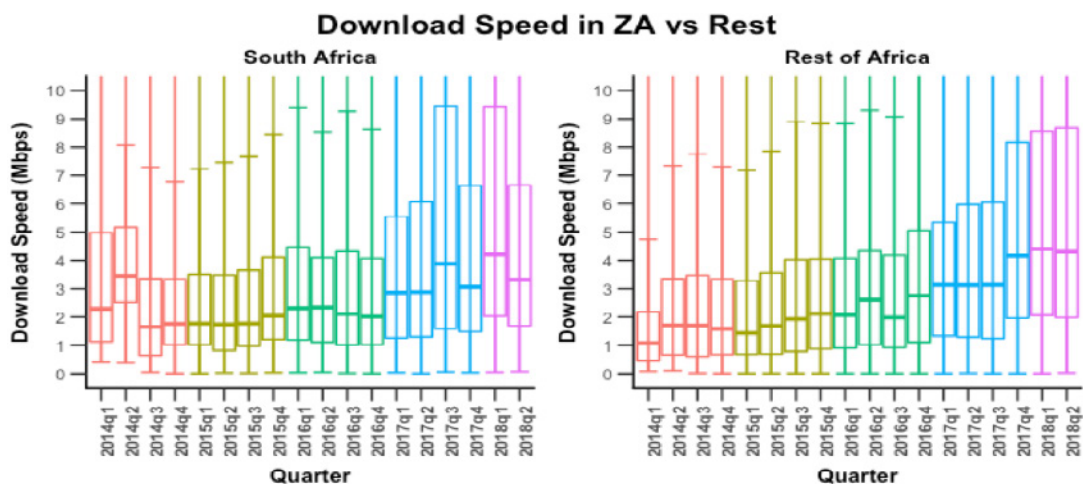


Figure 12: Download speed in South Africa versus the rest of Africa (Q1 2014 - Q2 2018)

Source: SpeedChecker, 2018

Figure 13 shows download speeds for the African countries for which measurement information was obtained from SpeedChecker.⁸⁰ All regions recorded similar median download speeds between Q1 of 2014 and Q1 of 2018 ranging from 1 Mbps to 1.5 Mbps, except for the Northern region, which performed better, having recorded a median speed of almost 3 Mbps.

Within SADC, the recorded download speeds in South Africa are higher than speeds in any of the other southern African countries. While South Africa has significant backbone coverage of over 150 000 km, significantly more than any other sub-Saharan country, its robustness is not consistent throughout. While some companies have invested in much lower capacity networks and others in networks with a more-limited lifespan, some parts of the network will require reinvestment. The deployment of microwave technology used to be regarded as problematic as expenditure was intended for fibre roll-out, for example, with the SA Connect connection of public buildings.

⁸⁰ Speedchecker is a private company running large-scale software-based monitoring networks. They operate a global measurement network spanning over 170 countries. See: <http://www.speedchecker.xyz/>

4. GLOBAL INDICES - *continued*

However, the latest microwave technology deployments are providing the almost instantaneous, high-speed connectivity urgently needed by rural clinics, for example, and by the CSIR to connect public buildings and by BBI to rapidly connect remote public buildings⁸¹.

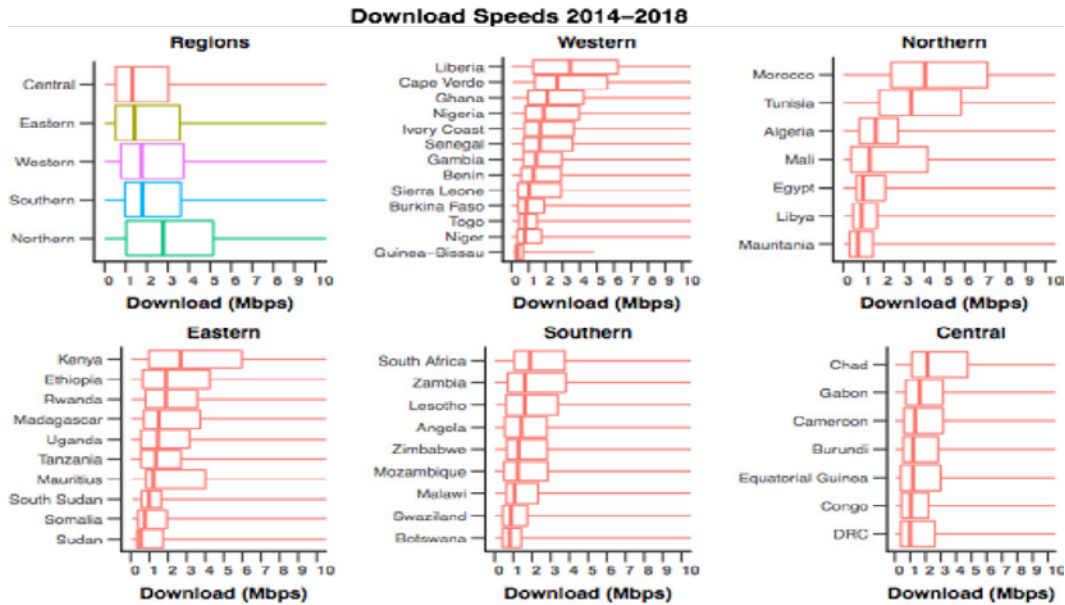


Figure 13: Download speeds for selected countries/region (Mbps)

Source: SpeedChecker, 2018

4.2.6. Competition

As the competition component of sector performance is at the centre of any ecosystem, it has an impact on and is affected by other components. Fair competition in the sector leads to reasonable returns on investment for operators and affordable prices for end-users.

Competition is evaluated by a concentration measure (the HHI) and wholesale prices such as those for mobile termination rates (MTRs). The market is highly concentrated, with two operators, Vodacom and MTN, controlling more than 80% of the market. This indicates that, despite the entry of two other players (Cell C and Telkom), the dominant position of incumbents makes it difficult for late entrants to wrestle market share away from them.

The benchmarking exercise shows that African markets overall are highly concentrated. An assessment of the HHI shows that South African telecommunications is highly concentrated, with an HHI index of 3.495, which is higher than the 2.500 rule-of-thumb measure for high




⁸¹ Personal interviews with Kobus Roux, Meraka Institute CSIR, 15 April 2019; Phatang Nkereyane, Broadband Infracore, 19 March 2019; Mike Pare, June 2019

4. GLOBAL INDICES - *continued*

concentration but lower than the average HHI of the other benchmark countries. The dominant operator, Vodacom, holds close to 50% of the market share.




Before proposing recommendations, the following section will provide a broad identification of the preconditions and enablers that a cross-cutting digital policy would need to include and the current activities that have been identified in them that would require integration and co-ordination for South Africa to develop an organic national digital policy as a developing country that is increasingly integrated into the global economy

Table 13: Benchmarking South Africa against Ghana, Kenya and Nigeria on Competition

COMPETITION	COUNTRY-LEVEL INDICATOR	TRAFFIC LIGHT	COMPARISON AVERAGE
Market concentration (HHI)	3 495		4 087.66
Number of mobile operators (excluding MVNOs)	4		5
of the largest operator	47.18%		50.69%

Source: GSMA, 2017

Table 14: Benchmarking South Africa against Argentina, Colombia, Guatemala, Paraguay and Peru on Competition

COMPETITION	COUNTRY-LEVEL INDICATOR	TRAFFIC LIGHT	COMPARISON AVERAGE
Market concentration (HHI)	3 495		3 822
Number of mobile operators (excluding MVNOs)	4		4
Market share of the largest operator	47.18%		43.2%

Source: GSMA, 2017

5. FOURTH INDUSTRIAL REVOLUTION?

Similar to many other countries, South Africa has been swept up in what is popularly referred to as the “Fourth Industrial Revolution” (4IR). One can trace the policy trajectory back to early 2017 when the African National Congress (ANC) referenced the 4IR at its 54th National Congress in the context of “catalysing economic growth, building an inclusive society [and] advancing a balanced public discourse”,⁸² More recently, in his inaugural address, President Cyril Ramaphosa said:

“Africa is poised once again to rise, to assume its place among the free and equal nations of the world. We must use that innovative talent that originated in Africa to embrace and use the Fourth Industrial Revolution to develop Africa and create jobs for the youth and empower the women of our continent.”

The proposed vehicle for catalysing the 4IR in South Africa is a Presidential Commission on the 4IR, which President Ramaphosa announced in his first State of the Nation Address.⁸³ Shortly before the election in May 2019, he identified a group of thirty commissioners for the Presidential Commission on the 4IR.⁸⁴ In his 2019 State of the Nation Address, President Ramaphosa explained that the country was trying to ‘effectively and with greater urgency harness technological change in pursuit of inclusive growth and social development’ through the 4IR Commission. The Commission, he noted, would ‘serve as a national overarching advisory mechanism on digital transformation’ that would ‘identify and recommend policies, strategies and plans that will position South Africa as a global competitive player within the digital revolution space’.⁸⁵

While the reasons for policymakers’ enthusiasm for the 4IR, like President Ramaphosa’s, might seem on trend with global leaders, the origins, meaning and potential value of the 4IR can and should be interrogated. A critical approach to the 4IR is important, particularly in developing country contexts, because of its growing popularity among a range of stakeholders (not only leading politicians). Such devotion is resulting in significant (development) resources being spent on promoting the 4IR by policymakers, despite limited corresponding evidence as to its outcomes and impact on countries at different stages of development, especially in relation to harms and benefits.

⁸² African National Congress (ANC). (2017). Communications & the Battle of Ideas: ANC discussion document 2017, Politicsweb. Available at: <https://www.politicsweb.co.za/documents/communications--the-battle-of-ideas-anc-discussion>.

⁸³ Ramaphosa, C. (2018) IN FULL | Read Cyril Ramaphosa's first state of the nation address. Timeslive. Available at: <https://www.timeslive.co.za/politics/2018-02-16-in-full-read-cyril-ramaphosas-first-state-of-the-nation-address/>

⁸⁴ The Presidency. (2019). President appoints Commission on the Fourth Industrial Revolution. The Presidency of the Republic of South Africa. Available at: <http://www.thepresidency.gov.za/press-statements/president-appoints-commission-fourth-industrial-revolution>

⁸⁵ South African Government. (2019). President Cyril Ramaphosa State of the Nation 2019. SA Government. Pretoria. Available at: <https://www.gov.za/speeches/president-cyril-ramaphosa-2019-state-nation-address-7-feb-2019-0000>

5. FOURTH INDUSTRIAL REVOLUTION? - *continued*

5.1. What does the 4IR mean and where does it come from?

Conceptualised in 2016 by the executive chairman of the WEF, Klaus Schwab, the 4IR and its technologies are characterised by their potential to propel digitally-ready countries into a new age of unprecedented economic prosperity.⁸⁶

A dominant Schwabian discourse actively promotes the potential of 4IR technologies, such as artificial intelligence, machine learning, the Internet of Things, cloud computing and big data analytics, as having the ability to enhance productivity and even the prosperity of nations. The negative consequences that may accompany the 4IR are briefly acknowledged in, for instance, the context of impending disruptions to traditional forms of work requiring differently skilled labour forces, and the subjugation of human decision-making in robotics.

How did or do we get to a Fourth Industrial Revolution (4IR)? From this perspective, progress is apparently based on the advent of technology that significantly changes processes of production,⁸⁷ namely:

- the 1IR is associated with mechanisation, water, steam power and railways in the late-18th and early-19th centuries;
- the 2IR is associated with mass production and assembly lines enabled by electricity in the late-19th and early-20th centuries;
- the 3IR is associated with information processing with the advent of computers and automation from the 1960s. In some parts of the world, it reaches scale by the 1980s, and is accompanied by the expansion of Internet access and the liberalisation of markets; and
- the 4IR is associated with cyber-physical systems and is based on the interconnectivity between physical, biological and digital spheres, starting from the beginning of the 21st century

The notion of a 4IR might be a convenient way of packaging history and of mobilising people but there is nothing inherent in so-called 4IR technologies that will necessarily result in economic growth, job creation or empowerment of the marginalised.

Evidence from the so-called third industrial revolution tells us we should not take for granted that technology will translate into wage or productivity growth. Nor will it necessarily generate “decent work”.⁸⁸ Countries must first develop a good set of complementary policies, both as business and government, to reap the benefits of these increasingly pervasive advanced technologies.

⁸⁶ Schwab, K. (2016). The Fourth Industrial Revolution: What it means, how to respond. World Economic Forum, Switzerland: Davos-Klosters. Available at: <https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/>

⁸⁷ Unwin, T. (2019, March 9) Why the notion of a Fourth Industrial Revolution is so problematic. Tim Unwin's blog. Available at: <https://unwin.wordpress.com/2019/03/09/why-the-notion-of-a-fourth-industrial-revolution-is-so-problematic/>

⁸⁸ Van Reenen, J. (2019). Where Will Future Jobs and Growth Come From? LSE Public Lecture
<http://www.lse.ac.uk/Events/2019/05/20190522t1830vOT/Where-Will-Future-Jobs-and-Growth-Come-From>

5. FOURTH INDUSTRIAL REVOLUTION? - *continued*

The conflation of broad digital policy required to support social and economic transformation with this narrower aspect of the deployment and governance of the data associated with '4IR' technologies is problematic. In fact, layering these advanced technologies over the existing structural inequality in South Africa will exacerbate existing social, economic and political inequalities.

It is not that advanced technologies cannot be mobilised for developmental purposes. However, technology, in and of itself, cannot change or disrupt existing modes of production. It also cannot determine positive or negative outcomes.

The interests that mobilise behind or drive certain innovations, and the uses to which the resulting technologies are put, determine their social, economic and political outcomes. While there are disruptive aspects to these significant technological changes, they tend to be more evolutionary than the discourse suggests. These changes also tend to build upon earlier developments which are often overlapping.⁸⁹

5.1.1. Beyond technological determinism

Technology is of course disruptive and the speed at which digital technology develops is unprecedented – one only has to look at the impact of Uber on the taxi industry or Airbnb on the hotel industry. As in other contexts, it is also changing the way we work, live and play in South Africa.⁹⁰ Technological determinism, which assumes that technology is the factor, which plays a central role in how our societies evolve and develop, is an overly reductionist and long since discredited manner of approaching socio-economic development.⁹¹ Technology is essentially designed and used by people, and unless more holistic and contextual approaches are used to understand its actual and projected impact in our country, policymakers will be unable to reduce inequality, poverty and unemployment.

This holistic and contextual approach needs to ensure that a more equitable, just and inclusive transition to the 4IR and the processes of digital change must be people-centred. The call to centre people and the public in the process of digital transformation rests on both an ethical and developmental foundation. Precisely how AI technologies will impact on human actions, cognitions, behaviours and freedoms is currently unknown, however, there is recognition that it is subject to significant power differentials between corporate-state and civic actors, at multiple scales. Enabling a more grounded and democratic process to ensure citizen-centric adoption and adaptation of digital technologies, especially in political economies such as South Africa, is thus an ethical imperative: people must be central to processes of mediation, management and regulation of technological change.⁹²

⁸⁹ Poole, S. (2017, January 6). The Fourth Industrial Revolution – Adapt to new technology or perish. The Guardian. Available at: <https://www.theguardian.com/books/2017/jan/06/the-fourth-industrial-revolution-by-klaus-schwab-review>

⁹⁰ Corporates and start-ups in South Africa have already deployed drones in the areas of agriculture, big data analytics and artificial intelligence in the insurance industry, and the largest 3D printer in the world is located at the CSIR. (Personal interviews with Kobus Roux, Meraka Institute CSIR, 15 April 2019; Professor Tshildizi Marwala, Vice-Chancellor and Principal University of Johannesburg, 18 April 2019)

⁹¹ Smith, M.L. & Reilly, K.M.A. (Eds). (2013). Open Development: Networked Innovations in International Development. The MIT Press: IDRC

⁹² Letouze, E.& Pentland, A. (2018). Towards a Human Artificial Intelligence for Human Development. ICT Discoveries Special Issue 2, in submission made by Dr Rushil Ranchod, Associate Director, Relational Wellbeing Collaborative.

5. FOURTH INDUSTRIAL REVOLUTION? - *continued*

As noted by the Pathways to Prosperity Commission's Digital Roadmap: How Developing Countries Can Get Ahead (2020),⁹³ putting people at the centre of digital transformation processes empowers us through 'voice'. Greater engagement and dialogue with communities and people is necessary to understand how the process of digital change will affect them, how it may influence, and be influenced by specific contextual factors and how its negative consequences may be managed at a local level. In this way, voice mechanisms build trust and enhance the social contract. Effective governance and regulation of the 4IR therefore requires a strong, democratic digital compact between the public, private and civic sectors.

5.1.2. Before we get to a 4IR, we need to take care of 1,2,3

If one ignores the semantic, factual and historical problems with the notion of a 4IR, it still remains problematic from a practical perspective in, specifically, a developing country context such as South Africa. Technological developments do proffer many opportunities for sustainable development but no technology in a vacuum can address underlying inequalities. It is not the technology in and of itself that changes or disrupt existing modes of production or determines positive or negative outcomes. It is the interests that mobilise behind or drive certain innovations and the uses to which the resulting technologies are put.

The reasons for policymakers embracing the 4IR concept are not as surprising as they might first seem. This echoes the uncritical adoption or inability to adapt previous waves of telecom reform in the absence of organically developed, evidence-based policy formulation. This is not to suggest that we should eschew all international best practice, simply that we need adopt only what is appropriate to our context based on our priorities and adapt what we need to carve a credible space for ourselves in the global community.

Appropriation of the term 4IR by one of the most powerful global epistemic communities, the World Economic Forum, that convenes annually to build consensus between the private and public sector on what the future of the world should look like with massive private sector resources, fills a vacuum for many countries that have not invested in what they want the future to look like. When a ready-made vision based on extensive research committed to global prosperity provides some roadmap in an uncertain future, it is adopted in the absence of anything else.

There is much in the WEF that draws on the evidence of positive outcomes of market reforms and development requirements and on the necessary regulatory and developmental catch-up developing countries will have to play. However, much of the research is based on the assumptions and practice of advanced economies and mature democracies. Generally it fails to ask, or because of its protocols, nor say why previous rounds of market reform have failed to implement the basic logic of reforms, why in many developing countries there are not capacitated, effective institutions

⁹³ Pathways for Prosperity Commission. (2019). The Digital Roadmap: how developing countries can get ahead. Final report of the Pathways for Prosperity Commission. Oxford, UK. Available at: <https://pathwayscommission.bsg.ox.ac.uk/digital-roadmap>

5. FOURTH INDUSTRIAL REVOLUTION? - *continued*

to enforce the rule of law and the universal declaration of human rights or to regulate markets in ways to maximise consumer welfare rather than rent extraction.

In the Global North, although dissenting academia and civil society may not sit at the Davos table, their well-funded (though declining) academic and research institutions can, and with publicly available local data contest the meaning and potential value of national and global digital initiatives on the basis of independent research that can be interrogated in public policy processes when they are domesticated back home.

Most African academic institutions are teaching institutions in which there is often not funding for research. In South Africa, NRF funding for digital research is focused on STEM and within universities, digital research continues within traditional silos. There is little multidisciplinary research being undertaken at postgraduate level on what was recently described at an international meeting on jurisdictional challenges to retaining an open and unfragmented Internet, as the latest 'civilisational challenge'⁹⁴ of organising billions of people around the world within a highly complex and adaptive system requiring global collaboration and general principles and norms to accommodate the greatest diversity. What is provided by development banks, multilateral agencies, global industry associations and the WEF, as the policy and regulatory frameworks to ensure digital inclusion, are simply adopted to checklist the next phase of market reform.

In South Africa, because of the dearth of STEM expertise, research funding for studies of digitization and innovation have gone into science and technology. Although there are minute pockets of research on IPR, cybersecurity and data protection, ICT and policy and regulation, economic and competition regulation, and information and communication technology for development (ICT4D), there is no integrated multidisciplinary research expertise being drawn together to inform national digital policy in this area. This is both a result of and a cause of the retreat since the third democratic administration, as part of the narrow conceptualization of the developmental state to fund and draw on almost exclusively, in some areas, the national research councils for policy input. In the area of ICT, this has meant that entire policy areas have been informed by technical and engineering perspectives, often with no reference to business models, financial sustainability and certainly not to broader socio-economic outcomes.

If South Africa is to realise President Ramaphosa's dream of once again "...rising to be one of the free and equal nations of the world...",⁹⁵ our policymakers cannot afford to simply adopt global 4IR mantras designed for different, more mature contexts than the ones in which we operate. We need to critically evaluate how we can harness the benefits associated with this brave new world for South Africa and its citizens. Can we identify risks associated with such technological developments? Can we safeguard citizens from the potential harms that accompany the 4IR?

⁹⁴ Bertrand de La Chapelle, Internet Jurisdiction Policy Network, closing address Berlin, Germany June 2019

⁹⁵ 2019 President Cyril Ramaphosa's inauguration speech: <https://www.timeslive.co.za/politics/2019-05-25-in-full-president-cyril-ramaphosas-inauguration-speech/>

5. FOURTH INDUSTRIAL REVOLUTION? - *continued*

How can we mitigate the risks? Perhaps most importantly, how do we ensure that the digital inequality that exists in South Africa today is not exacerbated by the unfettered adoption of new technologies and systems that are optimised on grounds of efficiency and productivity alone? How do we ensure that no one is left behind, as our politicians have promised?

5.2. Digital futures

This analysis of South Africa's preparedness for a digital future challenges whether narrowly focusing on 4IR can deliver on national policy objectives of economic growth, job creation and inequality reduction. The approach of this paper is that the challenges of 'digitalisation' facing the country are not new or impending. We face them right now. Understanding the evolutionary dimensions of these revolutions are as important as the disruptions.

The application of ICT to the production and services sectors to improve efficiencies, resulting in widespread automation with negative impacts on employment, have been with us for decades. These negative effects are undoubtedly amplified by advanced technologies associated with the 4IR - artificial intelligence, machine learning, blockchain and new robotics - and require mitigation strategies. These advanced technologies also have development potential, however, and can stimulate new areas of production and services, with positive multipliers.

While preparing for these inevitable technological developments is an important aspect of developing a forward-looking digital policy, the conflation of a broad digital policy required to support social and economic transformation with the narrow-advanced technologies of artificial intelligence, blockchain, drones and machine learning is problematic.

Instead, this paper recommends a transversal digital policy that cuts across traditional sectoral silos providing co-ordination not only between government departments but between the public and private sector and civil society, enabling the deployment of private skills, capital and technology to ensure the delivery of digital public goods.

From a policy perspective it is critical to ensure that the preconditions necessary for harnessing the benefits of the 4IR are met, if the technologies are to serve developmental purposes, rather than exacerbate existing social, economic and political inequalities.

5.3. 4IR sectoral policy in SA

Several South African government departments have developed WEF-inspired 4IR strategies for their sectors. With the Department of Science and Technology (DST) at the cutting edge of research and development (R&D) and innovation, they have probably been swiftest to respond to the 4IR call on the basis of a long and strong technology and innovation policy agenda. Features of the, as yet unpublished, new White Paper on Science, Technology and Innovation include

5. FOURTH INDUSTRIAL REVOLUTION? - *continued*

several strategies and institutional arrangements to improve South Africa's preparedness for the 4IR. Sectoral development and planning will take place together with the private sector through industry associations such as MINTEK in mining or AgriSA in agriculture. This process will build on the sector innovation funds that are already functional and connect government with industry associations, which are linked to universities that have competence.

The DST has focused on the CSIR to strengthen industrial policy in the country. The ICT RD&I strategy aims to achieve a marked increase in advanced human resource capacity, promote world-class research and build robust innovation chains for the creation of new high-tech small ICT enterprises. Although the implementation strategy requires partnerships involving government, the private sector and higher education institutions, the bulk of state investment has gone to the CSIR's Meraka Institute, which manages and co-ordinates the implementation of the strategy.

The Department of Trade and Industry (DTI) makes reference to the 4IR in the Industrial Policy Action Plan (IPAP) 2018/19–2020/21 by noting that the South African government has established a Chief Directorate: Future Industrial Production & Technologies (FIP&T) unit to investigate the possible effects of the 4IR and prepare governmental capacity for addressing the subsequent challenges.

The DTI has also highlighted several risks associated with zero-sum outcomes for the country. The Ministry of Higher Education has accepted the mandate of re-gearing the system to produce the high-level skills required to prepare South Africa for the digital future but perhaps with less preoccupation with the 4IR as a revolutionary moment.

A policy paper commissioned by the Department of Arts and Culture correctly points out that the pace of changes in relation to global economies of scale, entail a high level of complexity and uncertainty that will impact on the local cultural and creative industries. The paper importantly points out that digital transformation, which it erroneously says is also known as 4IR, will completely revolutionize the world's governance, trade and social conditions at an unprecedented pace. The DAC paper seeks to provide a scenario-based strategic foresight methodology as a basis for strategic visioning and long-term planning for South Africa's uptake of the 4IR, with a particular reference to the cultural and creative industries. It draws almost exclusively on the WEF frameworks and literature, adopting a disruptive technology approach and identifying the key technologies as AI and the IoT. While anticipating job losses, it highlights the efficiency in production that will result from being able to deploy advanced technology, using WEF figures to describe the impact on job losses.

This has implications for the future of broadcasting in South Africa and particularly the importance of public broadcasting, which remain the primary source of information for the majority of South Africans.

5. FOURTH INDUSTRIAL REVOLUTION? - *continued*

The most recent discussion document is from the DTSP that was merged again with the DOC to become the Department of Communications and Digital Technologies (DCDT). It is also the lead department within government on the 4IR and the Secretariat to the 4IR Commission. The DOC commissioned Accenture, the international consultancy that partners with the WEF globally on the 4IR, to prepare a framework for the department. This, it says, will enable South Africa to become 4IR-ready. It is concerning that this document may form the base policy document for South Africa on the 4IR.

Without any references or specified data sources or methodology - other than that the model is the outcome of a WEF-Accenture collaboration - the report claims that 4IR technologies across industries in South Africa can, over the next decade, contribute R5 trillion worth of social and economic value. It also claims that they will create four million jobs.⁹⁶

Historical and current figures on job creation and economic growth make these seem unlikely. Economic growth has hovered between 2% and negative growth over the past two years and best long-term growth predictions under current policy conditions estimate 3.5%. We have produced 270 000 to 300 000 jobs on average over the past five years and we have about 700 000 new young people entering the job market a year. The Centre for Economic Development and Transformation propose that a growth rate of around 10% will be required to absorb these new entrants into the economy, however, the current growth is only expected to rise to 2.1% by 2021. With a nod to digital inclusion, the report does observe that to create a sufficiently conducive environment, South Africa will need to meet several conditions. These include improved connectivity, effective regulation and functioning markets. Optimised consumer welfare, redressing poor education outcomes, and developing an appropriate digital skills base for the new economy will also all be crucial. While this is all undoubtedly correct, this is no revelation - as these are all objectives of the current policy that South Africa has failed to achieve to various degrees over the past 25 years.

The Accenture report makes no effort to explain why two decades of policy reform and sector regulation have failed to maximise consumer welfare, its primary objective. It also does not explain why the sector is instead characterised by rent extraction, by both the private sector (high prices) and the state (licence fees and secondary sectoral taxes that contribute to the high prices and are not reinvested in universal access despite this being levied for this purpose).

Like other reports from the international consultants over the years, the Department's 4IR report fails to engage with a host of critical inhibitors of productive digital inclusion and diffusion of advanced technologies beyond an elite few. It does not ask why previous rounds of market reform were not successfully implemented and there is no reference to the lack of institutional endowments necessary to implement so-called international "best practices" in the country. The

⁹⁶ For a quick reality check, the average growth rate has hovered between 2 % and negative growth over the past two years and best long-term growth predictions under current policy conditions estimate 3.5%. We have produced 270 000 to 300 000 jobs on average over the past five years and we have about 700 000 new young people entering the job market a year. The Centre for Economic Development and Transformation proposes that a growth rate of around 10% will be required to absorb these new entrants into the economy.

5. FOURTH INDUSTRIAL REVOLUTION? - *continued*

government's solution to the lack of policy research in this area has been the establishment of the WEF Centre for the 4IR based at the CSIR.

5.4. Data and research needs

Without public investment in independent, local, multidisciplinary digital policy research there has been no local research base to prepare policy makers for the 4IR. Public interest research in this area has long been dependent on the vagaries of donor funding, which has now been diverted to 4IR. While better funded than most African countries, only 0.8% of GDP in South Africa is spent on research, compared to 1.3% in Brazil.⁹⁷ However, none of this is being directed into multidisciplinary digital policy research required to address digitalisation and datafication. South Africa needs to institutionalise digital data gathering into the national statistical system which underpins multidisciplinary policy research in its universities and policy formulation. Only then will it be able to develop organic policy and regulatory strategies different to those that have failed in developing country contexts.

This needs to be framed within the context of an open-data policy that safeguards users rights and which will enable the free flow of information required for more effective planning by government and service delivery entities to increase the uptake of online rather than face-to-face transactions. Importantly, reliable public data can fuel entrepreneurialism and innovation, especially for SMMEs and start-ups who do not have their own big data to leverage for commercial application.

5.5. Digital inequality paradox

Paradoxically, as more people are connected to the Internet or even those who are not become data subjects through inclusion in digital systems such as digital and biometric identity, digital inequality is increasing. This is not only the case between those online and those offline (as is the case in a voice and basic text environment) but also between those who are barely online, only using digital services for minimal, passive consumption and those that have the technical and financial resources to actively consume services, or even producing and/or selling digital goods and services and contributing to the wealth of nations.

Similarly, as more people who do not have the awareness or skills to exercise their rights go online, vulnerability to the risk increases. Without digital literacy, people are unlikely to be able to exercise their rights when using apps and services that collect personal information and use algorithms to target their advertising or which can be used by governments for surveillance.

The governance of this digital-inequality paradox is arguably the biggest policy challenge for nations in an increasingly fractured global, digital economy and society. The intractability of this

⁹⁷ The World Bank Research and development expenditure (% of GDP). Available at: <https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS?end=2015&locations=ZA&start=2015&view=bar>

5. FOURTH INDUSTRIAL REVOLUTION? - *continued*

policy problem lies in the increasing complexity and adaptiveness of the global communications system over which nation states, and particularly developing countries, have little control.

Yet under these conditions of flux and uncertainty, countries must create the conditions necessary to attract the massive infrastructure investments required for these technological developments to permeate throughout the economy and society while managing the inevitable impacts of digitalisation and globalisation at the national level. It cannot be taken for granted that technology will translate to wage growth or productivity growth unless we develop a good set of complementary policies at the business and government levels. Management at both these levels will be critical to developing a policy agenda that not only boosts productivity but also shares benefits among the citizenry and creates inclusive prosperity. Although it is beyond the scope of this exercise to explore, in any depth, the caution against exacerbating inequalities that applies to current "Smart" applications.

There is considerable evidence that 'Smart Cities', for example, have further enhanced the wellbeing of citizens and corporate citizens with already privileged access to municipal resources. Active ways of countering this inherent tendency towards digital inequality from a policy perspective is to start such initiatives from the bottom up via 'Smart Townships' and 'Smart Villages'. This is dealt with in section 6.10.10.

Policy formulation must include a broad range of demand stimulation measures, from public access through widespread availability, through ubiquitous public Wi-Fi, to promoting the development of relevant local content in local languages. Smart townships and smart village strategies should be actively pursued to counter the widening of the digital divide between smart city initiatives and their surroundings. The application of Smart to national infrastructures, such as power, is also a way of spreading the efficiency gains across all citizens (connected to the grid).

The introduction of a Smart Grid is something that South Africa has been wavering on for over a decade despite the very strong case for it. The decision by the government to more actively pursue renewable energy sources, with the need to shift loads from different sources and for the bulk storage required, will make a Smart Grid essential, with very positive multiplier effects.

6. PRECONDITIONS AND ENABLERS OF THE DIGITAL ECONOMY

The benchmarking exercise on key policy indicators shows that South Africa is significantly ahead of its African comparator countries in terms of achieving the goal of access, using indicators of mobile coverage and use but fares less well compared to five comparator Latin American countries. (It should be noted that the results of the Latin American countries are aggregated with several having lower GDPs per capita than South Africa.) As the exercise shows, this is largely as a result of having extensive mobile coverage of the population and even geographically. However, when compared to the comparator Latin American countries, South Africa fares less well on this front. In relation to use – measured by ARPU, data traffic and social networking (a proxy for the Internet) – South Africa also performs very well compared to its African counterparts but does not fare as well as its Latin American comparators.

With regards to pricing and affordability, South Africa scores poorly against the aggregate of African countries used in the benchmark. These results are perhaps unsurprising given the findings and recommendations after the recent Competition Commission pricing hearings, which stipulated that retail prices would need to come down significantly to be cost-based (the Commission proposed a reduction of at least 25%). As indicated, these prices need to be benchmarked and assessed against quality of service. The availability and quality of the signal is particularly important as far as consumer preferences in a data environment are concerned.

Vodacom consistently outperforms other operators across the continent in quality of service tests (demonstrated in the benchmarking exercise). There is also good value for high-end users from all operators with 10 GB and 20 GB packages available at a cost of R0.06 per MB compared to 500 MB bundles costing R0.09 per megabyte. Despite Vodacom's relatively high prices, consumers are choosing to pay a premium to have access to its quality network, and its market share continues to increase against other players in the market that offer lower prices and are perceived to provide poorer quality services. This is made possible by the significant investments that mobile operators have made in network extensions and upgrades over the last five years. Vodacom and MTN have invested on average R15 billion annually over the past five years. Telkom and Cell C are also investing heavily in their networks, although their total investment is lower with Cell C utilising a cash injection from the buy-out by Blue Label Telecom.

The implication of this for policymaking is that consumers at the top end of the market are being well-served and get value from their products but the poor are paying a premium for low-value products, which is preventing them from using the Internet optimally. Of those who do use the Internet, 33% of South Africans stated that the price of data is unaffordable, and an even higher percentage said that they could not afford devices. It is clear that even with effectively regulated prices, the price of services within current business models and licensing frameworks is not affordable for large numbers of people.

6. PRECONDITIONS AND ENABLERS OF THE DIGITAL ECONOMY - *continued*

6.1. Competition regulation and pricing

In the absence of effective sector regulation by ICASA and the persistence of high prices in the market, the Ministry of Finance stepped in instructing the Competition Commission to undertake an inquiry into data prices. The market outcomes and the possible unintended competition consequences of the competition ruling are still to be seen. However, the Commission's cuts in retail prices is unlikely to fix poor competitive outcomes in the market. That can only be resolved by regulating the underlying bottlenecks in the wholesale market - specifically access to and the costs of roaming, facilities leasing and access to application programming interface (API).

These bottlenecks are correctly identified in the Commission's summary report of its comprehensive data price study released in December 2019⁹⁸. It urges the sector regulator responsible for economic regulation of the telecommunications sector, ICASA, to remedy the situation in the wholesale market urgently.

Telecommunications regulators around the world define markets and determine dominance in these markets in order to design the appropriate ex-ante regulation that promotes competition as the mechanism to deliver affordable user prices and efficient investments. Ex-ante regulation is regulation designed to protect consumers in the retail market by safeguarding fair competition in wholesale markets where the bottlenecks occur.

This essential mechanism creates a level playing field for late entrants in South Africa by reducing the negative duopoly effects of MTN and Vodacom on the market, one of which is high prices. Prices and profit levels of the incumbents are undoubtedly high, with above average company EBITDA's (Earnings Before Interest, Taxes, Depreciation, and Amortization) of around 40%, as the benchmarking by the Commission correctly shows. This indicates that the operators could accommodate retail price reductions.

However, the right price ought to result from effective regulation and competition in the wholesale market. It is precisely for this reason that Chapter 10 of the 2005 Electronic Communications Act requires ICASA to undertake a market review to determine and remedy market dominance, which the Commission urges it to conclude urgently.

Despite undertaking the market review three times, at enormous public expense, twice to completion, ICASA has failed for more than a decade to make this critical determination. Last year ICASA made an interim finding on markets but failed to propose remedies for dominance.

⁹⁸ Competition Commission (2019) Data Services Market Inquiry Summary Of Provisional Findings And Recommendations <http://www.compcom.co.za/wp-content/uploads/2019/12/Data-Services-Inquiry-Summary.pdf>

6. PRECONDITIONS AND ENABLERS OF THE DIGITAL ECONOMY - *continued*

While operators should not be penalised for their business success in a fair competitive market, it is the dominance of the incumbents, MTN and Vodacom in the wholesale market that prevents late entrants, Cell C and Telkom Mobile from competing fairly and being able to exert pricing pressure. The Competition Act assumes dominance when a firm has over 35% market share.⁹⁹

This is because, in a data environment, quality is as important as price – more so, if the majority of South Africans forego the far lower prices offered by Cell C and Telkom Mobile – despite the #datamustfall campaign – for the more expensive, higher quality network of the dominant operators.

Vodacom and MTN's dominance enable them to have the liquidity to reinvest in their network infrastructure, extending coverage and improving quality. Vodacom, the most responsive of all the players to the inevitable rise of the data market, was swift off the mark a few years ago, leveraging its voice surpluses to invest in their data network, quickly becoming the most pervasive and best quality network.

This, in turn, enables Vodacom (and later MTN when it wakes up) to attract more customers and thereby increase its surpluses, placing them in a better position to more effectively deploy the artificially limited spectrum they had and further enhance the quality of their networks. Even in the absence of anti-competitive practices, this creates a virtuous business cycle for the dominant operators, vicious for the smaller operators who cannot compete without timely, cost-based access to dominant operators' networks.

There are several possible unintended consequences of the retail price intervention by the Commission.

Without ICASA addressing the wholesale issues urgently, the outcome could be that Vodacom and MTN, with dramatically reduced prices, attract price-sensitive users from the late entrant networks, leaving Cell C and Telkom Mobile unable to compete on both price and quality. With dominant operators prices more attractive and late entrants unable to address critical quality challenges, users will be driven to incumbent networks.

That the public focus has been on the mandatory retail price reductions for operators, the unintended consequences to the market are unclear but may include inhibiting network investment. This should not obscure the important points made by the Commission about the absence of effective regulation by ICASA in the wholesale market that need to be remedied – including the critical issues of releasing the high demand spectrum that has stifled cost-effective 4G deployment in South Africa.

⁹⁹ <http://www.compcom.co.za/abuse-of-dominance/>

6. PRECONDITIONS AND ENABLERS OF THE DIGITAL ECONOMY - *continued*

Wholesale price regulation is therefore critical to creating a fair and competitive environment. It has to be done in a way that does not inhibit potential pro-poor product innovation as markets become saturated at current price points to tap into the 'long tail' of the unconnected. It must also not remove the incentive for network investment, of which a significant portion (around R15 billion a year) of the incumbents' surpluses have historically significantly gone into - albeit still leaving the management and shareholders very well off.

6.2. Taxation

The harmonisation of fiscal and taxation policies, which would support the transition of the region from a free trade area (achieved in 2008) to an economic and monetary union (EMU), is feasible¹⁰⁰. A co-ordinated approach to tax policies is expected to facilitate trade throughout the region and co-ordinated tax incentives have the potential to encourage foreign investment. Nevertheless, currently SADC exports are oriented mostly to Europe rather than internally within the SADC, reducing opportunities of intra-regional trade. Although there has been much progress in SADC with regards to deepening integration, SADC member states are at different stages of economic, political and social development, which inhibit member countries from adopting common priorities and common models or frameworks.

Currently, the existing regulations and policy are focused on developing the core foundation for the 4IR, which is the development of communications infrastructure with the aim of increasing connectivity reach to the wider population. The South African National Broadband Policy (SA Connect) was developed to meet the goals of South Africa's NDP by laying the groundwork for an integrated supply-side and demand-side strategy to meet the NDP's goals of a '... dynamic and connected information society and a vibrant knowledge economy that is more inclusive and prosperous' by 2030.

However, the NDP itself fails to thread ICTs throughout the strategy, in accordance with this 'crosscutting nature'. Policies such as the Vision 2020, the NDP, the Telecommunications Amendment Act (2001), the ICASA Act (2000), the Electronic Communications Act (2005), SA Connect and the National Integrated ICT Policy White Paper are all relevant regulations that, if properly executed, can lay the foundation for the development of a fourth industrial economy and society, and therefore encourage greater integration of technology across various sectors including agriculture, energy and industrialisation.

While African countries have developed policies and regulations to improve the socio-economic landscape of their countries, the lack of implementation and limited government support, among other political factors, has hampered proper ICT development from both the supply- and demand-sides.

¹⁰⁰ Ade M, Rossouw J & Gwatidzo T (2017) Analysis of tax harmonization in the SADC. ERS Working Paper No. 684. Available at: https://econrsa.org/2017/wp-content/uploads/working_paper_684.pdf

6. PRECONDITIONS AND ENABLERS OF THE DIGITAL ECONOMY - *continued*

ICT development needs to encourage long-term sustainability and overall socio-economic well-being for the continent. Drafting modern and sustainable policy and regulations will be crucial to ensure a healthier uptake of advanced technologies. Hence, the development and effective implementation of the Cybercrimes and Cybersecurity Bill, as well as the protection of personal data of Internet users and the protection of online purchases of goods and services will be crucial to create demand for the Internet. While on the supply-side, the ICT infrastructure is the core precondition for the development of the 4IR, which needs to be well regulated with fair competition. Concurrently, there has to be a demand-side strategy that is regulated and that encourages the development of:

- Internet content across various sectors (education, health, government)
- digital skills that are integrated at primary education level
- affordable data plans and smart devices
- plans to curb illiteracy.

6.3. Governance

South Africa has a strong constitutional basis for the development of appropriate institutional arrangements to create the enabling environment for investment in digital services and innovation, while safeguarding the rights of citizens to ensure their safe and secure participation in the digital economy.

This is likely to require some institutional redesign and upskilling to enable the necessary integration of the diverse areas of regulatory specialisation – from economic sectoral regulation, to domain name and numbering, content and data governance – to manage the policy tensions between these areas while remaining sufficiently nimble to deal with this increasingly dynamic, complex and adaptive global digital system.

Global governance

Government will need to be skilled enough to engage robustly but co-operatively with structures of global governance while engaging and negotiating international and continental codes of practice, guidelines and agreements in the interests and context of the local economy and safeguarding the rights of the South African citizenry. Caution should be exercised in inhibiting operator and user innovation arising from the very different conditions that exist in developing countries. These systems are able to find ways around bottlenecks in the old infrastructures and institutions. Currently, they overcome the lack of co-ordination between the private sector and the state in terms of investment in infrastructure, demand stimulation, and supply of services.

Internet governance occurs through multiple different forums but all practice some form of multi-stakeholder decision-making or practice including governments, although in many that has not preferential standing, the private sector, civil society and academia. The technical governance of the

6. PRECONDITIONS AND ENABLERS OF THE DIGITAL ECONOMY - *continued*

Internet, through ICANN, the International Corporation for Assigning Names and Numbers, through institutional design is dominated by private interests and those of the technical community. A non-decision making but influential normative body, the Internet Governance Forum, lacks government representation and strongly represents the interests of civil society and rights organisations from around the world.

Internet governance is, as a result, at the core of most developed governments' international relations agendas. Witness the support of various governments' International Affairs Ministries for the annual Internet Governance Forum (IGF), the Stockholm Internet Forum, and the Freedom Online Coalition (FOC), to name just a few. However, African governments tend to be, at best, recipients of technical assistance for cybersecurity or data protection that will safeguard global security of the Net. Few engage either in the technical, multilateral or open governance forums. International co-ordination no longer happens only through multilateral institutions responsible for the international co-ordination of member states, though South Africa's once active participation in the forums of the International Telecommunications Union (ITU), has in any way waned over the past decade and half.

New organisations dedicated to Internet governance are not member state-based or driven but generally adopt a collaborative or 'multi-stakeholder' approach to governance, usually with predominance of one of the stakeholder groups. On a technical level, this includes policy platforms like the Internet Engineering Task Force (IETF) and the ICANN. Besides agencies such as the World Trade Organization (WTO) or World Intellectual Property Organization (WIPO) working toward the development of formal agreements between member states to enable free trade or the protection of IP respectively, significant lobbying resources are now dedicated by global interests (e.g., the World Economic Forum), the global mobile industry association (GSMA), and even some big platforms and applications (e.g., Facebook and its WhatsApp and Instagram applications, or Google (Alphabet)) on convincing governments to enable their big data businesses to be more globally competitive by benefiting from the data of users in the global South.

South African international participation in these bodies takes place through siloed sectoral representation at the Ministerial and Departmental level. In this regard, South Africa needs to develop a far more integrated international governance digital strategy that cuts across technical governance of the Internet, cyber-safety and security, to e-trade and e-taxation. For this, it will need to be far more actively engaged with diverse global policy platforms like ICANN, the IGF, and at the continental and regional level in AUC and SADC, in which it used to play a leadership role.

6.4.Key enabling infrastructure

Infrastructure integration across various sectors includes digital infrastructure and services, and electricity. Currently, digital services, especially base stations, data warehouses and cloud providers, are dependent on high-quality, stable power supplies. Many mobile operators have

6. PRECONDITIONS AND ENABLERS OF THE DIGITAL ECONOMY - *continued*

found alternative energy sources either for primary or redundancy purposes, having built mobile networks in countries without any grid outside of the major centres.

The effectiveness of advanced technology is dependent on the pervasive, high-speed and stable bandwidth. All new technologies such as the IoT, AI and robotics require a constant supply of energy, with blockchain being particularly energy intensive. Therefore, energy also needs to be affordable (with the use of green energy wherever possible being ideal).

The primary Teraco Warehouse, a data centre service provider, in Gauteng spends more on electricity than bandwidth.¹⁰¹ Breaks in power supply in the manufacturing sector where advanced technologies have been installed can cause havoc in the manufacturing line. What is required to prepare the country for the digital (modern) economy is an integrated infrastructure plan. In new areas, spatial planning should include the integrated laying of energy and information infrastructure. This also needs to be articulated with the transport system. Although online procurement, e-commerce, and digital supply chain and logistics management cut out physical procurement, the physical distribution of goods still needs to take place over efficient postal, road, railway, port and airport systems.

6.5. Sector and competition regulation

While the regulation of digital infrastructure and services will require the same transparent accountability associated with economic regulation of the sector, the current static efficiency models traditionally used to regulate the liberalised telecommunications sector over the last 30 years will no longer suffice. Instrumental regulation of the dynamic, complex adaptive system of the Internet, on the grounds of what appears to be anti-competitive outcomes in traditional static, anti-competitive practice, is likely to inhibit innovation and result in other unintended consequences.¹⁰²

The clash of policy and regulatory cultures, reflected in the defence by traditional telecommunications incumbents of the revenues from OTT platform operators are, in fact, driving the demand for data and consequently new revenues for operators.

Likewise, the calls by late mobile entrants for bans on zero-rating of data to access global OTT platforms highlight the clash between technical principles of net neutrality applied to the Internet and public policy issues of universality and equality (of access not quality), traditionally applied to ensure equivalent quality of service for everyone who accesses the Internet, by preventing positive pricing discrimination.

¹⁰¹ Meintjies, N. (2017). Making data green. Brainstorm. Available at: <https://www.teraco.co.za/wp-content/uploads/2017/12/Green-IT.pdf>

¹⁰² Bauer, J. & M. Latzer. (Eds.) (2016). Handbook on the Economics of the Internet, Edward Elgar: Cheltenham.

6. PRECONDITIONS AND ENABLERS OF THE DIGITAL ECONOMY - *continued*

Applying zero-rating through negative pricing discrimination does not affect the technical quality of the Internet but rather entry to and use of it. In countries where affordable access is the main factor inhibiting Internet take-up and where even cost-based prices may be unaffordable to many, zero-rated services may provide access to the Internet that would not otherwise be acquired.¹⁰³

6.6. Data governance and data justice

The governance of critical digital infrastructure now has to include data and privacy protection, cybersecurity, cybercrime and anti-surveillance measures, in order to create a trusted environment in which e-government, e-commerce, democratic engagement and personal communications can flourish.

Additionally, data governance – when understood from a justice and rights perspective – requires not only protections from these risks and harms but also promotional and redistributive measures if data justice is to be realised. Such promotional and redistributive mechanisms can be significantly aided by ensuring the appropriate institutional mechanisms are in place and well-resourced.

South Africa has made some progress towards safeguarding citizens in this regard but for there to be data justice in the country, additional measures are required to ensure vulnerable groups are not further at risk as they come online. Other measures include making sure that they have access to services and meaningful content, and that m-government services are provided in user-friendly and multiple language formats, including for those who are hearing and sight impaired.

¹⁰³ Gillwald, A., Chair, C., Odofoywa, F., Kweku, K. & Walubengu, J. (2016). Much Ado About nothing: Zero-rating in the African context. (Series 4: Broadband 4 Africa) [Policy Paper]. Research ICT Africa Available at: https://www.researchictafrica.net/publications/Other_publications/2016_RIA_Zero-Rating_Policy_Paper_-_Much_ado_about_nothing.pdf

6. PRECONDITIONS AND ENABLERS OF THE DIGITAL ECONOMY - *continued*

Data protection

The Protection of Personal Information (POPI) Act was passed in 2013,¹⁰⁴ but has only partially come into effect – though full obligations will come into force on 1 July 2021.¹⁰⁵ While the Act establishes a new Information Regulator, the office only recently started more actively investigating data governance challenges like privacy breaches.¹⁰⁶ POPI is modelled on the EU's personal data protection framework, especially the Directive 95/46/EC of the European Parliament and of the Council of 24 October 1995. Under the POPI Act, cross-border transfers are forbidden unless they satisfy certain requirements – most notably that the recipient is subject to a law, code or contract that ensures a level of privacy protection equivalent to that of South Africa.¹⁰⁷ Importantly, the Information Regulator also has oversight of access to information, and thus could serve an instrumental role in the facilitation of data access. The establishment of specific data subject rights is a vital component of the emerging data protection regimes and will have a significant role in the lived reality of data justice in the digital economy context.

Cybersecurity

In terms of cybersecurity policy, the National Cyber Policy Framework (NCPF) was published by Cabinet in 2012 to set out measures and mechanisms for better co-ordination across the government. South Africa's NCPF was released at the end of 2015,¹⁰⁸ followed by a draft of the Cybercrimes and Cybersecurity Bill.¹⁰⁹ The final version of the Bill is now a Cybercrime Bill and is awaiting the signature of the President.¹¹⁰ While the adoption of the NCPF is a positive step towards co-ordinating efforts, the NCPF has proven difficult and slow to implement.¹¹¹

¹⁰⁴ See: Protection of Personal Information Act No. 4 of 2013. Available at: <https://www.gov.za/documents/protection-personal-information-act>

¹⁰⁵ In Presidential Proclamation No. 21 of 2020 (GG 43461), the President of the Republic of South Africa brought all remaining sections of the POPI Act into effect from 1 July 2020, though data collectors have a year from that point before full obligations arise (two sections 110 and 114(4) will come into effect on 30 June 2021).

¹⁰⁶ Niselow, T. (2018, June 19). Five massive data breaches affecting South Africans. Fin24. Available at: <https://www.fin24.com/Companies/ICT/five-massive-data-breaches-affecting-south-africans-20180619-2>

¹⁰⁷ Specifically, Section 72 of the PoPI Act provides the following with regard to the issue of 'data sovereignty':

(1) A responsible party in the Republic may not transfer personal information about a data subject to a third party who is in a foreign country unless any ONE of the following conditions/considerations exist –

(a) the third party who is the recipient of the information is subject to a law, binding corporate rules or binding agreement which provides an adequate level of protection that reflects the principles of PoPI;

(b) the data subject consents to the transfer;

(c) the transfer is necessary for the performance of a contract between the data subject and the responsible party;

(d) the transfer is necessary for the conclusion or performance of a contract concluded in the interest of the data subject; or

(e) the transfer is for the benefit of the data subject.

¹⁰⁸ State Security Agency. (2015). The National Cybersecurity Policy Framework. Available at: <https://www.gov.za/documents/national-cybersecurity-policy-framework-4-dec-2015-0000>

¹⁰⁹ Minister of Justice and Correctional Services. (2015). Cybercrimes and Cybersecurity Bill – Draft for public comment (B–2015). Available at: <http://www.justice.gov.za/legislation/invitations/CyberCrimesBill2015.pdf>

¹¹⁰ Michaelson. (2018). Cybercrime Bill in South Africa. Available at: <https://www.michaelsons.com/focus-areas/cybercrime-law/cybercrimes-bill-south-africa>. According to Ellipsis, 'The Department of Justice and Constitutional Development presented a radically amended version of the Bill to the Portfolio Committee for Justice and Correctional Services on 23 October 2018. The biggest shift is the removal of provisions relating to cybersecurity, necessitating the renaming of the Bill from the "Cybercrimes and Cybersecurity Bill" to the "Cybercrimes Bill"'. Available at: <https://www.ellipsis.co.za/cybercrimes-and-cybersecurity-bill/>.

¹¹¹ Sutherland, E. (2017). Governance of cybersecurity – the case of South Africa. The African Journal of Information and Communication (AJIC) 20: 83-112

6. PRECONDITIONS AND ENABLERS OF THE DIGITAL ECONOMY - *continued*

From an institutional design point of view, South Africa has adopted an inter-agency approach to cybersecurity. The government recognised at an early stage that the issue of cybersecurity is crosscutting and cannot be addressed by one department alone.¹¹² In line with this, a number of government departments are involved in cybersecurity. These include:

- the Justice, Crime Prevention and Security (JCPS) Cabinet Cluster, led by the Minister of Justice, who is in charge of reviewing all related legislation to ensure harmonisation and alignment.
- the DTSPS as part of the Cyber Response Committee (CRC) established under the Cluster and who is involved in ensuring alignment with the ECTA.
- the State Security Agency, which is tasked with the overall responsibility of cybersecurity and works with other relevant departments, including the DTSPS.

The plethora of organisations, clusters and structures involved in this process – many of which involve potential traditional rivalries – suggest that co-ordination could be problematic. Other challenges relate to implementation efficacy, including the degree to which the NCPF demands institutional arrangements for which it still lacks the administrative and technological skills to actually deliver.¹¹³ The institutional arrangements for cybersecurity also lack mechanisms for promoting safe information flows in terms of cybersecurity in government departments.¹¹⁴ It has also been criticised¹¹⁵ for lacking transparency or oversight, considering that the Cybersecurity Response Committee, in charge of strategy and decision-making, is chaired by the Director-General of State Security.

While the NCPF does not deal directly with '4IR' issues, its clauses around the classification of Internet content and service providers leave much to be desired – a worrying sign for the development of further bills. A number of different departments and agencies have had responsibility for different aspects of data governance, including the DTSPS, the Security and Justice Cluster, and now the Office of the Information Regulator, appointed in terms of POPI.

6.7. Open data and data access

Open data refers to the level of data available for the public, so that decisions can be made. Although the claim that data is the new oil of a modern economy, is not strictly correct, as (among other things) data is not a finite resource, it does highlight the value of data in the information and knowledge era. From a public policy perspective, the need for data access and transparency

¹¹² Department of Telecommunications & Postal Services (DTSPS). (2014). National Integrated ICT Policy Discussion Paper. Options Paper.

¹¹³ Department of Telecommunications & Postal Services (DTSPS). (2014). National Integrated ICT Policy Discussion Paper. Options paper; See also: Biermann, E. & Van Der Waag-Cowling, N. (2018, July 13). Mind the Gap: Addressing South Africa's cybersecurity skills shortage. Daily Maverick. Available at: <https://www.dailymaverick.co.za/article/2018-07-13-mind-the-gap-addressing-south-africas-cybersecurity-skills-shortage/>. According to the authors, South Africa is failing to produce enough cybersecurity specialists to secure its digital space, cybersecurity expertise is rather limited and the Department of Science and Technology (DST), which is mandated by the NCPF to develop, coordinate, and implement national capacity development programme, has failed so far to do so.

¹¹⁴ Patrick, H. (2015). Security information flow in the public sector: KZN health and education. PhD Thesis. University of KwaZulu-Natal, Durban

¹¹⁵ Privacy International. (2018). State of Privacy South Africa. Available at: <https://privacyinternational.org/state-privacy/1010/state-privacy-south-africa#commssurveillance>

6. PRECONDITIONS AND ENABLERS OF THE DIGITAL ECONOMY - *continued*

also becomes more urgent. It is in this context that data and information can be understood as a public good – available to whomever might need it on a non-rivalrous, non-exclusionary basis – whether for public policy planning or to make more symmetrical market information available to new entrants, including commercial- or community-based entities and start-ups, or for consumers to make more informed choices. In order to have accurate data on progress, ensure fairness and identify opportunities for the future, there is a need for public information regarding the availability of ICT resources and how they are currently utilised or not utilised.

The need for open data extends to supply-side, national administrative data acquired by state agencies from suppliers of services and products or gathered by the agencies, such as access, use and pricing indicators, and to national statistical demand-side data that are collected at the household, individual or firm level. This is all essential to inform national planning and effective regulation.

The demand for data is also informed by the needs of the technologies, which underscore the 4IR: AI and other technologies rely on big data in order for their benefits to be realised. Thus, while often discussions on data focus on data protection for citizens, the economic benefits of data rely on access and sharing being facilitated. Data provision and data protection serve as the needs underpinning citizen-centred data justice notions.

PAIA's aim is to foster a culture of transparency and accountability in both the public and private sectors and, in order to do so, to make provision for accessing information that is held by both public and private bodies in South Africa. However, both the Telecommunications Act (2000) and the Electronic Communications Act (2005) contain strong confidentiality clauses for businesses whereby any information relating to the financial capacity or business plans of any person or relating to any other matter reasonably justifying confidentiality, shall not be open to public inspection.

While it is important to protect strategic and competitive information, the Telecommunications Act (2000) gives the private sector a disproportionate amount of power to decide what information is confidential and, in some instances, to withhold information from the public. Understanding, through open data, the location of infrastructure, the technologies being deployed, where they are being deployed and where there are cheaper, as well as appropriate technologies and delivery models, including co-operative models, community networks, microcell operators, public Wi-Fi¹¹⁶ presence, and secondary and dynamic spectrum use, could bring down the cost of access for the population not online. Such open data is a public policy imperative if we are to address digital inequality.

¹¹⁶ See outcomes of different WiFi models currently in SA: Geerdts, C., Gillwald, A., Calandro, C., Chair, C., Moyo, M. & Rademan, B. (2016). Developing Smart Wi-Fi in South Africa. (Series 4: Broadband 4 Africa) [Policy Paper]. Research ICT Africa. Available at: https://www.researchictafrica.net/publications/Other_publications/2016_Public_Wi-Fi_Policy_Paper_-_Developing_Smart_Public_Wi-Fi_in_South_Africa.pdf

6. PRECONDITIONS AND ENABLERS OF THE DIGITAL ECONOMY - *continued*

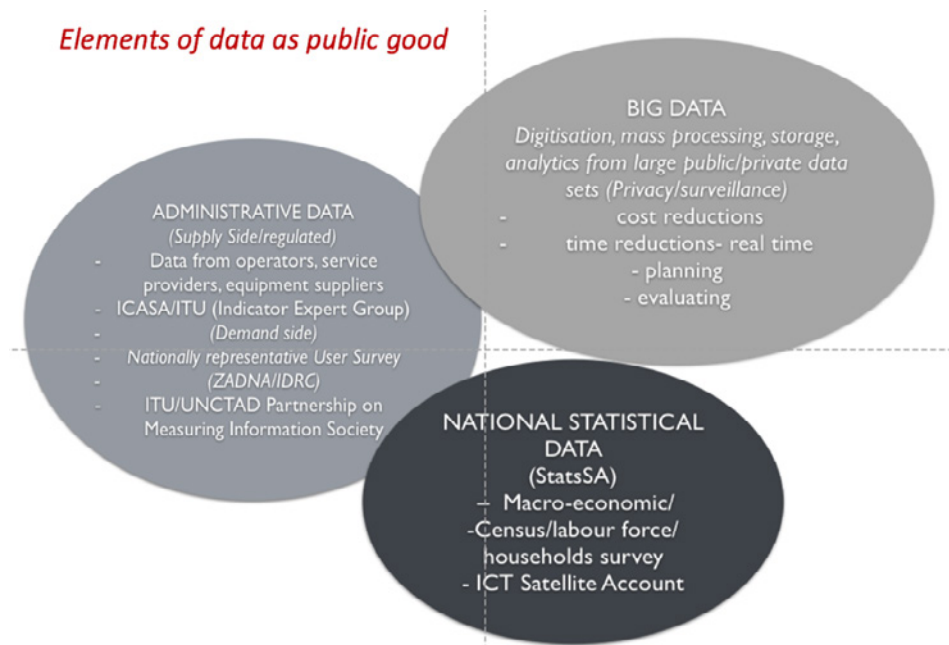


Figure 14: Communications sector data

Source: Research ICT Africa

Not only do open-data policies and practices for the telecoms sector enable assessment of our progress to realise these goals but they can institutionalise existing good practices in transparency among regulators, operators, service providers and the research community. These principles also underpin policy calls for open government.

Governments across the world have seen the potential of open data to increase both transparency and innovation in specific sectors and to better meet the needs of their citizens. Open-data policies contribute to more efficient and accountable governance and facilitate the exercising of human rights. Government and regulators cannot put requirements on business and industry while government data remains opaque. In the diagnostic analysis made to the National Planning Commission, Media Monitoring Africa(MMA)¹¹⁷ emphasised that there is a need for a human rights-based approach that incorporates both the constitutional framework and the international law commitments on access to the Internet. The constitutional framework made reference to rights such as equality and non-discrimination, information and children rights. The international law made reference to civil and political (women, girls and persons with disabilities) and socio-economic rights.

¹¹⁷ Submission made by Media Monitoring Africa (MMA), and endorsed by the South African National Editors' Forum (SANEF), the Interactive Advertising Bureau of South Africa (IABSA), the Centre for Human Rights (CHR), and the Coalition on the African Declaration on Internet Rights and Freedoms (AfDec Coalition).

6. PRECONDITIONS AND ENABLERS OF THE DIGITAL ECONOMY - *continued*

A case in point is the ongoing national campaign by the WEF and the then-DTPS: Data was gathered from stakeholders to map the telecom infrastructure in South Africa in support of the national broadband strategy (and now readiness for the 4IR). Some of the information was provided confidentially and other information was already in the public domain. The CSIR, which is responsible for gathering the data and mapping it, believe they are tied to the confidentiality undertakings that the data cannot be released, and even the maps are for the DOC's discretionary use. Despite operators lamenting the fact that they are constantly having to enter into non-disclosure agreements with different parties in order to provide information recently presented to ICASA, or that they would prefer simply to report to ICASA who could then make aggregated data available online, no one is demanding that this resource-intensive public process be used to put the general acceptance of open public processes and data into practice.

The telecommunications sector needs more transparency and would be well-served by the strategic release of the key data sources mentioned above. This is something that should be integrated into existing open government data initiatives, which by and large tend to be more rhetorically than practically implemented. While pushing for open data, it is imperative that private information remains anonymised and untraceable.

POPI ensures that Internet service and content providers have to inform users that they gather information about their browsing behaviour, seek the expressed consent of users before tracking their browsing behaviour and allow users to opt out of the data collection process.

6.8. Intellectual property

The transformation of the ownership of IP is one of the core aspects of the changed institutional arrangements required to ensure the more equitable participation and opportunities in new forms of production. This is exemplified by IP challenges of core technologies of the Fourth Industrial Revolution. Key regulatory instruments to meet these challenges, legislation on patents and copyright, are largely unchanged since their formulation in 1970's prior to the uptake of even 'Third Industrial Revolution' technologies in South Africa. Competition regulation has tended to avoid confronting the anti-competitive effects of IP and is under-prepared to address the competition challenges of IP. These regulatory gaps threaten the potential of the technologies associated with the construct of the Fourth Industrial Revolution to increase economic inclusion.

The Internet of Things holds potential for SMME's to participate in national and global value chains, however benefits from the IoT deployment are premised on integration of heterogeneous technical systems which are threatened by the competitive barriers raised by Standards Essential Patents (SEPs). SEPs are patents essential to implementation of a technology standard that enables

6. PRECONDITIONS AND ENABLERS OF THE DIGITAL ECONOMY - *continued*

computers to interact safely and efficiently. However, when licensing of SEPs and thus compliance with a standard is available only to extensive patent portfolio owners, participation is confined to a handful of global players, excluding small, medium and even large but not global technology companies from creating compatible technologies.¹¹⁸

Those jurisdictions which have dealt most successfully with SEP patent barriers to innovation have done so through a combination of patent specific and competition rules, however neither the current competition regime nor the 1978 Patent Act nor even the proposed changes to patent legislation offer South African regulators any clear powers to address the problem. Interoperability of software, and thus the software is also inhibited by copyright in software and associated anti-circumvention rules. In the global North largely uncontroversial copyright exceptions enable interoperability, a similar albeit more limited exception was introduced in copyright amendment legislation but has been stymied by the return of the legislation to Parliament with the exception (Section 19B of the proposed legislation) characterised as an unwarranted intrusion into copyright owner's rights.

As the general purpose technology of the next generation of technologies, AI is key. Machine learning, a leading AI technique, relies on input of massive datasets which include important categories such as photographs that cannot be assembled and used without copyright challenges. Some jurisdictions such as the European Union are attempting to make use of specific machine learning exceptions but these have been criticised as narrow and uncertain, thus inhibiting research.¹¹⁹ While other countries debate the possible solutions to copyright barriers to machine learning, AI researchers in the United States, the global leaders in AI, are unconstrained because they can rely on fair use. An attempt to introduce fair use into South African law, which would empower South African AI researchers has been blocked at the behest of some players in the entertainment industry.

Intellectual property awards exclusive rights over indispensable aspects of new technologies. Without appropriate adjustment in IP and competition regulation this will result in exclusion from participation in and benefit from technological developments.

6.9. Public sector digitalisation

The adoption and use of ICT by the public sector in South Africa has been notoriously bad. While the private sector scores highly in the adoption of ICT, finding expression in business development and innovation particularly in relation to the services sector, and individual consumption falls within global averages, the public sector is on the bottom side of global indices. 'As a result, or because of this, the public sector never gets the best that local industry provides, never mind international, and

¹¹⁸ Xiaoping Wu, 'Interplay between Patents and Standards in the Information and Communication Technology (ICT) Sector and Its Relevance to the Implementation of the WTO Agreements', 7 April 2017.

¹¹⁹ Sobrino-García I. Copyright in the Scientific Community. The Limitations and Exceptions in the European Union and Spanish Legal Frameworks. Publications. 2020; 8(2):27. 31-32).

6. PRECONDITIONS AND ENABLERS OF THE DIGITAL ECONOMY - *continued*

if we do, it is late and at a much higher price.¹²⁰ The DTSPS has developed a national e-government strategy aimed at modernising and transforming future public service delivery.

This is as a result of SITA being moved from the Department of Public Service Administration to the DTSPS without much rationale for the move, other than its poor performance in the DPSA. Continuity has been a challenge, with the databases remaining in the DPSA. The Diagnostic Report¹²¹ of the NDP diagnosed the malady in the poor performance of the South African public sector in terms of ICT access and use, as resulting from the opaque state IT procurement agency, SITA.

Rather than reducing state expenditure on ICT services through economies of scale and scope arising from aggregated procurement, government prices of services, which national and provincial departments were statutorily obliged to use, came at a premium compared to the prices of services directly acquired in the market. The turnaround seen in SITA in the last few years might be attributed to this move to the DTSPS but in fact progress started earlier with the entry of a new CEO, Setumo Mohapi, the first to ultimately serve out his term. He saw not only the negative impact within the public sector but also that the socio-economic effects of this on public sector delivery had been extremely negative.¹²²

Failure to adopt technology to support primary health care means South Africa performs very badly for even a lower middle-income country. Likewise, in primary and secondary education, implications for young people in terms of quality of education and employment opportunities have been devastating. Within the public sector, intergovernmental communication is poor. There is no sharing of data and information between national departments, as well as between national and provincial governments, and at local government level it is arguably worse.

The provision of government services could be aided significantly by enhanced capacity for implementing digital government services, as a method to supplement existing government services. This means that not only is it required of the government to improve internal capacity for the provision of such services, as well as adapt SITA's strategies for procurement but also that it enhances its capacity for ensuring the data justice components of this kind of role in the implementation of its services.

Adopting a business approach instead of a bureaucratic administrative one, the new cloud and 4IR projects planned by SITA seek to address this by creating a new business model. This has required shifting to wholesale operations from old tendering and procurement business processes that were wrought with inefficiency and corruption. 'It requires expanding the supply-side to make it

¹²⁰ Interview: Setumo Mohapi, CEO SITA, 30 April 2019

¹²¹ Op cit. Diagnostic Report of the NDP (2011). National Planning Commission. Available at <https://nationalplanningcommission.wordpress.com/the-work-of-the-commission-2/>

¹²² Interview: Setumo Mohapi, CEO SITA, 30 April 2019

6. PRECONDITIONS AND ENABLERS OF THE DIGITAL ECONOMY - *continued*

easier for different types of private players to participate and opening up the demand-side. This will require much greater effort in making government aware of products and services available'. The intention is to have a transparent digital marketplace of goods and services through a cloud-based ecosystem, accessible to users and sellers. The greatest challenges are not the technology or the cost but the internal mindset change.¹²³ The SITA Cloud Programme would:

- build and operate a common and secure government private cloud to assist government departments to consolidate their solutions by providing efficiency, interoperability and collaboration for all South African government departments;
- be the standardising agent for all government departments, ensuring that the existing cloud solutions, systems and applications are interoperable;
- drive collaboration between the departments;
- provide an open-data platform that allows government data to be consumed and shared between all departments, driving collaboration between the departments; and
- provide a policy framework to direct cloud computing adoption by government departments, which includes standards for all government departments to design systems/applications in a way that ensures they are interoperable with the government private cloud¹²⁴.

6.10. Human development

Good digital identity

Digital identity becomes a central enabler for engaging in public and private digital services, as well as a necessity for reaping forms of digital dividends. Digital identities can be viewed through the prism of a developmental economy with cited benefits being efficiency gains for government service delivery,¹²⁵ the ability to assert rights to access service (a vital component in terms of South Africa's developmental programme),¹²⁶ and/or boosts to financial inclusion.¹²⁷

Those development benefits cited consider broader digital identity systems. However, when digital identity is considered in the context of functional needs, it also becomes the mechanism through which consumers can engage with commercial services (whether B2C or B2B), and through which users engage in platform and other Internet services. And from a broader digital economy, digital identities are the mechanism through which, from the supply side, workers might engage (and benefit) from new forms of work.

¹²³ Interview: Setumo Mohapi, CEO SITA, 30 April 2019

¹²⁴ See: <http://www.sita.co.za/content/cloud-computing-0>

¹²⁵ Dahan, M. & Sudan, R. (2015). Digital IDs for Development: Access to identity and services for all. April 2015. Connections, World Bank Group. Available at: <https://openknowledge.worldbank.org/handle/10986/22297>.

¹²⁶ World Economic Forum. (2018). Digital Identity: On the Threshold of a Digital Identity Revolution (White Paper). WEF, 23-26 January 2018. Available at: http://www3.weforum.org/docs/White_Paper_Digital_Identity_Threshold_Digital_Identity_Revolution_report_2018.pdf.

¹²⁷ This benefit must be understood within context, Razzano, G. (2020). GoodID and Financial Inclusion: a call for context, available at: <https://researchictafrica.net/2020/02/05/good-id-and-financial-inclusion-a-call-for-context/>.

6. PRECONDITIONS AND ENABLERS OF THE DIGITAL ECONOMY - *continued*

In 2017, the World Bank, under its ID4D program, developed “Principles on Identification for Sustainable Development”.¹²⁸ Including guidance such as ensuring universal coverage and robust security, these Principles were then used as the foundation for the #Good ID movement. These kinds of principles should inform the establishment of both private and public sector designed digital identity systems, which are supported by sufficient data governance frameworks (the role of data subject rights will support the establishment of good digital identity in South Africa).

Digital identity systems must be designed considering both the context of South Africa's digital inequalities that will impede inclusivity but also in relation to how the development outcomes for digital identity systems make agency within such systems especially challenging for data subjects. Contrary to listed benefits of good identity systems, bad identity systems may play a role in exclusion and even growth in lived inequalities for citizens. This reiterates the need for the institutional mechanisms that support data justice imperatives being in place, and sufficiently resourced, as a necessary support to digital identity enablers - which necessarily include the Office of the Information Regulator.

Institutional strength must be supported by lawful data processes and practices from every actor in the digital identity value chain given its underpinning on personal identifying data, whether in the public or private sector.

Skills base for a digital economy

For most industries such as construction, logistics, financial, manufacturing, mining, agriculture and aerospace, advancements in AI, robotics, 3D printing and the IoT will put pressure on companies to move towards automation if they want to remain competitive in the global market. Adoption of technologies, however, implies a change in labour market demand and a dramatic realignment of the skills base. This is compounded by South Africa's labour and skills supply being unaligned with even earlier digital demands in the industrial and private sectors.

There is also a need to build a pipeline of future talent that can embrace this dynamic and increasingly digitised environment. The 2017 After Access Survey shows that one of the critical challenges to access and use of the Internet simply for consumptive purposes is a lack of education. Access and use of the Internet is determined by education and the associated factor of income. The current misalignment of labour supply and demand in the country means an oversupply of graduates in the humanities and insufficient STEM graduates and technicians.

¹²⁸ World Bank. (2017). Principles on Identification for Sustainable Development: Toward the Digital Age. World Bank. Available at: <http://documents.worldbank.org/curated/en/213581486378184357/pdf/Principles-on-identification-for-sustainable-development-toward-the-digital-age.pdf>

¹²⁹ Taylor, L. (2017). What is data justice? The case for connecting digital rights and freedoms globally. Big Data & Society July–December 2017: 1-14.

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There is a dramatic shortage of scientists, engineers, data scientists and specialised software developers and coders. The current education and skills base of the country continues to reflect extreme inequality particularly for those at the intersection of various forms of historical and traditional discrimination and marginalisation. A recent study on AI at global level found that 'there is a diversity crisis in the AI sector across gender and race', which is unlikely to be any different for South Africa if not addressed.

Recent studies found that only 18% of authors at leading AI conferences are women and more than 80% of AI professors are men. This disparity is extreme in the AI industry with women comprising only 15% of AI research staff at Facebook and 10% at Google. There is no public data on trans-workers or other gender minorities. The picture for black workers is even worse. For example, only 2.5% of Google's workforce is black, while Facebook and Microsoft are each at 4%.

'Given decades of concern and investment to redress this imbalance, the current state of the field is alarming'.¹³⁰ Strategies by the NRF and particularly the DST have been successful over the past few years with public higher education institutions (HEIs) producing 2 797 doctoral graduates in 2016, which was 10.6% more than in 2015 (2 530 PhD graduates), and 102.7% higher compared to that of 2009 (1 380 PhD graduates).¹³¹ Despite significant growth in the number of PhD graduates exiting public HEIs since 2009, this is far lower than that of other middle-income and emerging economies. The DST has initiated a number of programmes to improve high-level research through increased doctoral research as well as to support high-level research towards registering patents.

One programme is the Digital Advantage 2035, which operates through the CSIR to provide the capacity to implement the ICT Roadmap devised by DST in 2012.¹³² The ICT Research, Development and Innovation (RDI) Implementation Roadmap is a plan to guide the implementation of national ICT research, development and innovation strategy. The Roadmap is driven by the potential to deliver socio-economic impact, and presents a sound case for increased public and private investment in ICT R&D.

Digital Advantage is intended to enable South Africa to become a significant player in the global ICT RDI arena by:

- providing more targeted engagement with industry;
- focusing on international collaboration;
- accomplishing more comprehensive and transparent monitoring of investment; and
- making an impact, such as through jobs and business creation, contribution to GDP, societal influence and positioning South Africa for strategic advantage.¹³³

¹³⁰ West, S.M., Whittaker, M. & Crawford, K. (2019). Discriminating Systems: Gender, Race and Power in AI. AI Now Institute. Available at: <https://ainowinstitute.org/discriminatingystems.html>

¹³¹ Department of Higher Education and Training (2016). Statistics on Post-School Education and Training in South Africa, 2016. Available at: http://www.dhet.gov.za/Research%20Coordination%20Monitoring%20and%20Evaluation/6_DHET%20Stats%20Report_04%20April%202018.pdf

¹³² Interview: Dr Phil Mjwara, DG DST, 15 April 2019

¹³³ Department of Science and Innovation (2013). ICT and RDI Roadmap. Available at: https://www.dst.gov.za/images/ict_rdi_roadmap.pdf

6. PRECONDITIONS AND ENABLERS OF THE DIGITAL ECONOMY - *continued*

There is also a need to address the lack of human capital, specifically the skills deficits associated with digital skills ranging from basic literacy to the high-level engineering and advanced coding, as well as for data scientists and expertise in the application of traditional skills sets in economics, politics and sociology to a digital environment. While digital literacy may assist with more informed consumption, it requires greater skills to shift from consumption to production, whether as a worker, employer or entrepreneur. From a job creation and employment perspective, the lack of alignment between supply-side skills and demand-side market needs means few opportunities in the digital realm are being seized.

To embrace the digital economy, South Africa will have to invest in developing new skill sets in line with the shift occurring in an increasingly digitalised and globalised workplace. There is a need to build a pipeline of future talent that can embrace the age of emerging technologies. The 2017 After Access Survey shows that one of the critical challenges to adoption and use of the Internet is lack of technological skills. The study finds that 48% of the 146 million people in the 10 African countries surveyed, including South Africa, do not know how to use the Internet.

There is, therefore, a need to focus on developing an adaptive workforce. Critically, the school curriculum must be developed in such a way that it fosters the take-up of science, technology, engineering and mathematical courses, which will allow South Africa to take advantage of the new wave of emerging technologies that is shifting the nature of work globally. These are challenges not specific to the 4IR. There is evidence both from WEF surveys¹³⁴ of industry and mLab¹³⁵ that the way in which people are educated will need to change to prepare them for work in the future, and even in the present.

It is clear that education that streams students into disciplines and teaches in silos is not going to prepare people for the complexity and integration of advanced technologies into everyday life. While automation and AI can relatively replace industrial workers and even high-level skilled personnel, it cannot substitute for leadership and creativity.

People will need to be provided with 'soft' as well as with 'hard' skills. With greater automation in industry, far fewer people will be employed in traditional areas and there will need to be large-scale development of entrepreneurial skills to enable them to create their own work or to work with multiple employers on freelance and micro work.

Already, a substantial number of businesses in South Africa have embraced new technological trends and therefore can play a significant role in helping educators tailor and update the curricula to meet future requirements and, most importantly, fast-track training to meet the supply shortage for appropriate skills.

¹³³ WEF (2018). Future of Jobs Report. available at http://www3.weforum.org/docs/WEF_Future_of_Jobs_2018.pdf

¹³⁴ See: <https://mlab.co.za>

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Public-private interplays

While formal public-private partnerships (PPPs) to develop primary telecommunications infrastructure have not been as successful in South Africa as in many parts of the developing world, despite the punting of them by development banks, leveraging private skills and capital, and transferring some of the risk associated with investment in public goods, they are likely to be key to South Africa fast-tracking skills development, building safe and secure online platforms and services, and enabling public Wi-Fi, including private micro or niche and community networks or services. With all forms of data and the skills and knowledge to process and analyse them being the prime asset in the digital economy, South Africa has to overcome the skills gap swiftly to optimise new technologies for national development and global competitiveness.

A recent gathering by SADC Ministers of Education & Training, Science, Technology and Innovation reviewed the progress and implementation of ongoing programmes and initiatives in these sectors, and in particular to the region's agenda around 4IR. The consensus was that the development of digital skills, for both learners and teachers, is paramount and PPPs are needed to drive the change and innovation required for 4IR. However, a lack of funding could hamper these efforts.¹³⁶

Arguably, the greatest success story here is that of Harambee, a youth job accelerator that links 500 000 job seekers to 50 000 employers through matching demand for skills with supply, by fast-tracking customised digital skills training of youth with the aptitude to do different kinds of digital work. This alternative to requiring formal education certification, where young people receive training at a fraction of the cost, brings unemployed youth into the workplace where they are needed at a fraction of the cost of training graduates through a long-term degree and whose skills often don't align with industry needs.

Business Process Outsourcing (BPO) (call centres) has found new life within a digital economy and advanced technology environment with the application of AI and big data analytics behind the migration into different channels such as webchat and app servicing from more transactional voice-type channels. What Harambee is doing is 'slowing down the disruption everyone expects in the complexity and doing some of the heavy lifting required to achieve the utopia in the hype'¹³⁷.

Business Process Enabling South Africa (BPESA) operates both as a specialist investment promotion agency for business process outsourcing (including contact centres) and as a national trade association and networking body for the industry.

¹³⁶ CNBC Africa (2018, July 9). The 4th Industrial Revolution a Catalyst for Growth; How SADC is keeping up. CNBCAfrica. Available at: <https://www.cnbc africa.com/sponsored/2018/07/09/sadc-4th-industrial-revolution/>

¹³⁷ Interview: Evan Jones, Business Process Enabling South Africa (BPESA), 26 April 2019

6. PRECONDITIONS AND ENABLERS OF THE DIGITAL ECONOMY - *continued*

While Harambee had partnered with the public sector, specifically DST and mLab previously, following the Presidential Jobs Summit in 2018 and together with BPESA, it has partnered with the Presidency to develop the skills required in the rejuvenated business process outsourcing sector and to bring 100 000 unemployed and underemployed youth into employment at the same time, providing a blueprint not only for local industry but for PPP initiatives globally.

Having been a weak competitor in the BPO and IT-enabled services when they took off in India and subsequently Mauritius a decade and a half ago - due mainly to the high cost of international bandwidth and perceived inflexible labour practices - South Africa was ranked first in the 2019 Global Sourcing Association's 'best offshore destination' category, and in the influential analyst report as the second most-favourable destination, up against India and the Philippines.

Future of Work

Automation is not new and increasingly characterises technological introductions of new technologies for each so-called industrial revolution. As automation has become more sophisticated, it has led to significant redundancies, for example, in the automotive industry, which since the 1970s has become highly automated with significant job losses over the last two decades of the previous millennium. With machine learning and AI, automation may intensify and move to higher-level skills, though there is evidence that job losses can be managed through reskilling.

The WEF Future of Jobs 2018 report suggests that very low-level manual jobs are unlikely to be affordably replaced and as yet, AI and robotics are not able to simulate creative areas of work or those requiring 'soft skills' or those requiring emotional engagement.¹³⁸ Countries that are unable to keep abreast of rapid technological advancement and innovation, as a whole, may also become less competitive in increasingly globalised markets.

The Department of Trade and Industry (DTI), in conjunction with a number of other agencies and industrial research centres, has already set about implementing strategies to improve South Africa's preparedness.¹³⁹ To avoid the unfavourable disruption of 4IR in the manufacturing sector, the key enablers detailed in the next section need to be put into place. To position the manufacturing industry for 4IR, South Africa is encouraged to focus on these strengths and use these strengths to prepare for emerging technologies.

¹³⁸ WEF Future of Jobs 2018. Available at: <https://www.weforum.org/reports/the-future-of-jobs-report-2018>

¹³⁹ The DTI. Future Industrial Production and Technologies. Available at: http://www.dti.gov.za/industrial_development/fipt.jsp

6. PRECONDITIONS AND ENABLERS OF THE DIGITAL ECONOMY - *continued*

Skilled Personnel

Skilled personnel are a requisite to operate or work with the advanced and/or emerging technologies in the 4IR. Without adequate preparation, South Africa will not be able to adopt new production methodologies that will emerge as a result of advanced technology.

At present, South Africa's system of education and skills, that is, more skilled jobs, less manual work, is lagging and there is limited availability of skilled labour in the manufacturing sector, for example. South Africa will need to rectify this in order to mitigate future job losses as a result of the introduction of 4IR technologies and to have an adequate skills pool to harness the benefits that come with 4IR in manufacturing and other sectors such as automotive, retail, agriculture, food and beverages.

Also, although there is displacement of jobs in the middle skills or wage category, there is growth in the services sector and the creation of primary and secondary jobs as the result of this. For example, the massive job cuts seen with improved efficiency and productivity as a result of digitisation of communication infrastructure and services have spurred secondary jobs in the retail sector.

As indicated, disruption is not uniform and the disruption created by the gig economy (arguably 3IR) is already playing out extensively across the globe, though not very much in Africa because of low penetration rates.

Although many of the WEF-influenced reports¹⁴⁰ and the consultancies to the government highlight the potential of frictionless, non-geographically tethered work offered by online work, the RIA report on the state of microwork in Africa reveals that much of the online work in Africa is manual work that is sourced through a digital platform such as e-hailing, domestic work and maintenance services.¹⁴¹

In South Africa, only 8% of Internet users do online work with a very small proportion of those doing highly-skilled work such, as accounting or auditing, as opposed to data inputting, for example, which is more common.

Actual microwork is limited, however, and both the Africa and Asia After Access Surveys indicated that although digital online work offered real opportunities for some, for most it was one of many survivalist strategies that amplified offline labour exploitation rather than provide a viable

¹⁴⁰ WEF Future of Jobs Report (2018). Available at: <https://www.weforum.org/reports/the-future-of-jobs-report-2018>; Accenture Consulting (2018). Creating South Africa's Future Workforce. Report prepared for the DoC. Available at: https://www.accenture.com/_acnmedia/PDF-70/Accenture-Creating-South-Africa-Future-Workforce.pdf#zoom=50

¹⁴¹ Mothobi M, Schoentgen A & Gillwald A (2018) What is the State of Microwork in Africa? Research ICT Africa Policy Paper No. 5 After Access: Paper No. 2. Available at: https://researchictafrica.net/wp/wp-content/uploads/2018/10/After-Access_The-state-of-microwork-in-Africa.pdf

6. PRECONDITIONS AND ENABLERS OF THE DIGITAL ECONOMY - *continued*

alternative to it. The work of the Fair Work Foundation suggests that microwork is a race to bottom as the global supply of labour far outstripped demand.

Localisation and repatriation incentives

There is a need to develop regulations that address the challenges related to 4IR. A key example of this is the Patriot Corporation Incentive being set up by the DTI. This incentive is for companies that voluntarily establish their headquarters in South Africa and produce a significant proportion of their goods and services locally. Benefits under this incentive will be given to metal beneficiation for products linked to 4IR, including localisation of activities in the fields of AI, robotics, machine learning, and so on. Expanding such incentives to companies in or targeting the manufacturing segment would encourage availability and/or adoption of technologies and processes for manufacturing that will enhance the digital economy.

Tech hubs and incubators

Start-ups are vital to the organic development of innovation in the country. The tech start-up space drives the growth of home-grown digital innovation solutions, also signalling the nature of the evolution of the 4IR in the country. A key obstacle is the lack of funding in this space. The SADC governments have acknowledged the need to create favourable environments for investment and be more involved in local start-up ecosystems.¹⁴² To support the development of technological innovators and their conversion to viable business, South Africa has already made progress by supporting innovation through incubation hubs.

By 2016, the World Bank reported that there were about 173 technological hubs and incubators in Africa, with 32 of them located in South Africa. The South African incubators include the Gauteng's Innovation Hub, Jozihub and the Cape Innovation and Technological Initiative (CiTi). The World Bank was responsible for seeding mLab in Tshwane as a start-up incubator but this has been extended to skills acceleration with consistent funding from the DST. Combined with shorter-term grants and in partnership with the private sector, particularly some of the bigger names such as Nokia, Google Play, Microsoft and Intel, mLab is now more engaged in enterprise skills development programmes with major local skills accelerator and job connector, Harambee. The DST funded the Industry Innovation Partnership, which was developed by mLab specifically in response to the NDP's identification of e-skill needs in the economy. The programme is being rolled out at provincial level with co-funding from the provincial departments of economic development. Although these programmes have been regarded as successful in terms of the numbers of people

¹⁴² Kariuki H Africa is Prepared for the Fourth Industrial Revolution, Medium, 2 September 2018. Available at: <https://medium.com/@harriet436/africa-is-prepared-for-the-fourth-industrial-revolution-ae14e50daf16>

6. PRECONDITIONS AND ENABLERS OF THE DIGITAL ECONOMY - *continued*

trained, the head of mLabs has said that trying to extend programmes into provinces and townships is complicated, with initiatives reinforcing apartheid spatial realities and dependencies rather than integrating those acquiring skills into the urban markets and elite parts of the cities where with the opportunities exist.¹⁴³

The more economically developed provinces of Gauteng and the Western Cape have also developed innovation initiatives, often together with the megacities of Johannesburg and Cape Town, for example, Gauteng's Innovation Hub, Jozihub, the Cape Innovation and Technological Initiative (CiTi) and the Silicone Cape Initiative. The success and dynamism of many of the tech hubs on the continent, such as Kenya's iHub or Zambia's Bongohive, are attributed to them being bottom-up private, non-profit initiatives rather than the top-down state-sponsored initiatives most prevalent in South Africa. While these tech hubs attracted Development Bank and public funding once they developed high profiles, their sustainability would be and has been tenuous without it. One notable outcome of apartheid legacy issues is that venture capital (VC) funding, which supports the tech start-up sector globally, largely bypasses beneficiaries of state sponsored tech hubs in Africa, including South Africa.

Firstly, tech entrepreneurs' ability to attract VC funds is highly dependent on their social capital. Black South Africans from disadvantaged backgrounds lack the personal and professional networks to tap into VC funding. So, while South Africa's state-sponsored tech hubs, which tend to support black entrepreneurs, may be experiencing sustainability problems, the private VC funded start-up scene, especially in the broader Cape Town metropolitan area, known as Silicon Cape (which is predominantly white) is awash with investment capital. A 2018 survey of entrepreneurs from 170 tech start-ups in Silicon Cape found "a very high prevalence of venture capital funding in Cape Town", with a significant proportion of money coming from angel investors.¹⁴⁴ A similar study in the Johannesburg tech start-up sector highlights the funding challenges experienced by women and people from 'specific ethnic backgrounds' on a playing field that is described as not level.¹⁴⁵ This has distorted the racial profile of tech entrepreneurs not just in Cape Town but also in Johannesburg. Consequently, South Africa's digital economy continues to mirror racial patterns of division associated with winners and losers in the 4IR.

The second problem is that rent extraction via maximum profit exit strategies remain a major driver of investment funding, leading to short-termism in the types of start-ups that get funded. The result is a huge amount of investment funding being channelled to start-ups that extract value from society. The South African tech start-up sector is dominated by fintech and e-commerce initiatives. Fintechs accounted for more than a third of SA's tech start-up investments in the first

¹⁴³ Interviews with: Dr Phil Mjwara, DG DST, 15 April 2019; Derek Kotze, CEO mLabs, 17 April 2019

¹⁴⁴ Maha, A. & Morris, R. (2018). Evaluation and Network Analysis of the Cape Town-Stellenbosch Tech Sector. Endeavour Insight.

¹⁴⁵ Maha, A. & Morris, R. 2018. Evaluation and Network Analysis of the Johannesburg Tech Sector. Endeavour Insight, Tshimologong (Wits University) & JP Morgan.

6. PRECONDITIONS AND ENABLERS OF THE DIGITAL ECONOMY - *continued*

half of 2019.¹⁴⁶ The net result is that very little investment is going into start-ups that address long-term issues, such as climate change and other social impact issues associated with South Africa's development challenges.

The third start-up funding problem is highlighted by Prof. Barry Dwolatzky, founder of the Tshimologong Precinct tech hub, who argues that the start-up scene is being distorted by the objective that companies have to meet certain BEE obligations, with companies having to put in place a certain amount of funding to support start-up businesses or new enterprises that feed into their ecosystems. The big banks, for example, are putting up money to encourage entrepreneurs to develop new applications in the banking sector, running various challenges and supporting incubators leading to quite a lot of money going into fintech.¹⁴⁷ This is distorting the digital and broader economy.

So, while the start-up sustainability challenge highlights the need for complementary training in entrepreneurialism and management, in general, it can also be argued that the funding model of tech start-ups in relation to corporate and VC funding, must also come under review.

While state-supported innovation and tech hubs are the first steps in broadening the reach and impact of localised innovation enhancements, what is needed are more inclusive, civic-oriented innovation systems that can catalyse social innovation, driving processes of digital change which are responsive, embedded and adaptive to contextual dynamics and their specificities. These conditions may enable more localised innovation capacity, value and contributions to growth, which are potentially scalable and replicable and which support the development of robust national innovation systems.¹⁴⁸

Higher education

As a means of providing citizens with the requisite skills for participating in South Africa's digital economy and protecting their employment potential, a comprehensive turnaround strategy was developed by the Department of Higher Education and Training (DHET) for 50 FET colleges. The NDP aims to increase graduation levels to 75% in 2030, with all new courses and curricula in the ICT field being evaluated closely.

¹⁴⁶ Timm, S. 2019. Fintech accounts for over a third of SA tech startup investments in 2019 so far. Venture Burn [Online]. Available: <https://ventureburn.com/2019/07/fintech-over-a-third-of-sa-startup-investments-2019-so-far/>.

¹⁴⁷ Farouk, F. (2020). Alternative models for the digital economy - Social impact tech start-ups and platform co-operatives. The RIA Podcast. Available here: <https://researchictafrica.net/2020/07/31/alternative-models-for-the-digital-economy-social-impact-tech-start-ups-and-platform-co-operatives/>

¹⁴⁸ Mulgan, G. Adams, K. and Stokes, M. (2018). Civil society and the fourth industrial revolution, Blog, Nesta, <https://www.nesta.org.uk/blog/civil-society-and-fourth-industrial-revolution/> referenced in the submission made to the NPC commenting on the draft of this paper by Dr. Rushil Ranchod, Associate Director, Relational Wellbeing Collaborative.

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On-the-job training and short courses have been identified as the approach to take for workplace training. Within the context of the 4IR inter-ministerial committee, the former Minister of Higher Education and Training, Dr Naledi Pandor, said that she understood her mandate as one of supporting the leading edge of developments in this domain¹⁴⁹. Previously the Minister of Science and Technology, and having overseen the launch of the Square Kilometre Array (SKA), she said that project needs to be done by building on the skills that have been developed within large infrastructural projects such as the SKA, which were needed to meet the high level of skills required for the management and data processing associated with the initiative. Preparing the skills base for the 4IR, she said, involves ensuring there are sufficient people competent in the development of appropriate software and hardware.

She acknowledged the challenges with inter-ministerial committees and particularly the difficulty of co-ordination and leadership of parallel departments not accountable to each other. She indicated that dedicated leadership from within the Presidency may be what was required to achieve this. Public-private coordination was also a challenge.

In an effort to align the training and curricula that industry needs to achieve the national objective of global competitiveness, Pandor, together with the Ministry of Economic Development, met with industry leaders to engage them on the high-end skills required by the sector. She said a one-day symposium had been chaired by the Telkom CEO and that it would be repeated from time to time.

Science, technology and innovation

The Department of Science and Technology has been the stellar department over the past two decades with regards to innovation, foresight planning and implementation as well as the introduction of an integrated national research and innovation framework in the form of white papers on research and development, innovation and ICT, to provide roadmaps for technology and innovation, where our sectoral policy lagged.

An early policy and statutory intervention led to the establishment of a dedicated National Advisory Council on Innovation (NACI) in 1997. The Council continues to implement its legislative mandate and functions through the 2016–2021 Strategic Plan.

In it, NACI articulates a vision and identifies strategic outcome-oriented goals that seek to contribute to the realisation of the 2030 NDP vision and the Science, Technology and Innovation (STI) policy mix (1996 White Paper on Science and Technology and Ten-year Innovation Plan).

¹⁴⁹ Interview: Dr Naledi Pandor, former Minister of Higher Education and Training, 4 April 2019

6. PRECONDITIONS AND ENABLERS OF THE DIGITAL ECONOMY - *continued*

Although a second White Paper policy process is underway to update the policy and law, the mandate of the NACI to advise the Minister remains, together with the recognition contained in its strategic plan about the importance of focusing on both the foundation (disciplines or knowledge domains, infrastructure and human resources) of STI as well as its roles in addressing poverty, unemployment, inequality and a sluggish economy, and in meeting societal challenges (such as education, health, food security and global change)¹⁵⁰.

The Council sees having access to good-quality data, analytical capability, strong partnerships and healthy relationships with recipients of advice as critical. Some of the NACI's strengths include the ability to mobilise the National System of Innovation (NSI) stakeholders and provide access to local and international experts who complement limited resources. The NSI is a network of institutions and resources in the public and private sectors that develop, share, support and promote science and technology innovations, knowledge, skills, performance and learning on a national level. The NACI will build on its previous efforts to strengthen the NSI planning, monitoring and evaluation capability.

The Council remains committed to conducting a foresight exercise – the results of which will contribute towards the development of decadal plan for STI.¹⁵¹ Features of the, as yet, unpublished new White Paper on Science, Technology and Innovation include several strategies and institutional arrangements to improve South Africa's preparedness for the 4IR.

One strategy is that while NACI continues to provide advice on trends of innovation. A high-level structure of Ministers with overlapping science, technology and innovation functions will meet once a year to discuss and dedicate a portion of their budgets for research, development and innovation within the sector. This will provide financing for the much-needed, crosscutting system that departmental budgetary and performance silos currently prevent.

Sectoral development and planning will take place together with the private sector through industry associations such as MINTeK in mining or AgriSA in agriculture. This process will build on the sector innovation funds that are already functional and connect government with industry associations and which are linked to universities that have competence.

The institution that the DST has focused on to strengthen industrial policy in the country is the CSIR. As well as investing extensively in military and industrial research, the DST is leading the implementation of the national ICT research, development and innovation strategy through the CSIR's Meraka Institute to enhance its global competitive advantage. The ICT RDI strategy aims to achieve a marked increase in advanced human resource capacity, promote world-class research and build robust innovation chains for the creation of new high-tech small ICT enterprises.

¹⁵⁰ Interview: Dr Phil Mjwara, Director General of Science and Technology, 15 April 2019

¹⁵¹ National Advisory Council on Innovation (2018) NACI Annual Performance Plan 2018/2019. Available at: http://www.naci.org.za/wp-content/uploads/2018/07/NACI-APP-2018_2019.pdf

6. PRECONDITIONS AND ENABLERS OF THE DIGITAL ECONOMY - *continued*

Although the implementation strategy demands partnerships involving government, the private sector and higher education institutions, the bulk of state investment has gone to the Meraka Institute of the CSIR, which manages and co-ordinates the implementation of the strategy. An important envisaged outcome is '... a vibrant, sustainable and innovative indigenous ICT industry that addresses a significant portion of the country's ICT needs and attracts investments from overseas-based multinational ICT corporations in RDI and manufacturing facilities and resources in South Africa'.¹⁵²

The Centre for High-Performance Computing (CHPC), the South African Research Network (SANREN) and the very large databases are the three pillars of cyber-infrastructure that the DST supports. Hosted by the University of Cape Town and managed by the CSIR's Meraka Institute, the CHPC was the first of its kind in South Africa and is making scientific supercomputing a reality for the country.

Another major DST initiative together with the National Research Foundation (NRF) is the multibillion-Rand Square Kilometre Array, which is hosted in South Africa and Australia, and which extends into eight African countries. When it becomes operationally mature, the SKA will be the world's biggest telescope and also one of the biggest-ever scientific projects and multinational collaborations in the name of science. With thousands of linked radio wave receptors in Australia and in southern Africa, the amounts of data being collected and transmitted by the SKA means the project requires supercomputing power and big data management and analytics capabilities. The SKA project has also demanded unprecedented data connectivity. Meeting the advanced technological and engineering needs of this project has resulted in significant local skills development, enabled the creation of innovative new businesses and employment in the science, technology and engineering fields.

Aside from the benefits to science, big data capabilities could be the biggest spin-off from the SKA project.¹⁵³ Human capital development is already taking place as a result of the SKA project, with bursaries and scholarships being granted to allow students to learn the necessary cutting-edge science, technology, mathematics and engineering skills to support the project. As the SKA is a long-term project taking place over decades, its effect will increase exponentially. There is also a drive, through significant investments by the NRF, to increase PhD registrations with some positive results and a DST programme to support the developers of patents, though they remain low.¹⁵⁴

In future, there will be a strong drive to leverage the SKA as a spearhead for other programmes - including next generation high-performance computing challenges and big data challenges. Since 2005, the African SKA Human Capital Development Programme has awarded close to 400 grants for studies in astronomy and engineering from undergraduate to post-doctoral level, while also

¹⁵² See: <https://www.gov.za/about-government/government-programmes/square-kilometre-array-ska>

¹⁵³ See: <https://www.gov.za/about-government/government-programmes/square-kilometre-array-ska>

¹⁵⁴ Interview: Dr Phil Mjwara, Director General of Science and Technology, 15 April 2019

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investing in training programmes for technicians. Through the South African National Space Agency (SANSA), the country's capacity to design, build, maintain and possibly even launch satellites is being developed. As part of the four-country African Resource Management Constellation, South Africa has begun work on the ZA-ARMC1 satellite with R232 million being budgeted for this project over the next three years. This satellite will enhance Africa's ability to monitor and manage its precious natural resources.¹⁵⁵

With regard to the 4IR specifically, as mentioned earlier in the report, South Africa will soon join the World Economic Forum's Centre for the 4IR Network (C4IR Network) alongside China, India and Japan by launching an Affiliate Centre. The Forum established the C4IR in San Francisco in March 2017 as a hub for global, multi-stakeholder co-operation to develop policy frameworks and advance collaborations that accelerate the benefits of science and technology. The key portfolios include AI and machine learning, the Internet of Things, robotics, smart cities and digital trade. The South African Government, through the DST, intends to establish an Affiliate Centre as a public-private partnership based at the CSIR.¹⁵⁶

These initiatives by the state compensate enormously for low R&D investments by the private sector. On average, and compared to the value of their sales, South African manufacturing firms spend seven times less than American companies on R&D. Kenya, which has a far less developed economy than South Africa, spends 30% more per head on R&D than South Africa does.¹⁵⁷

Normal policy cycles are not suited to respond as quickly as these technological and scientific developments demand, which leaves many policies struggling to incorporate many new clauses as required by almost daily updates from industry. In addition to often being subsumed by ongoing updates, policies in South Africa tend to lack regulatory clarity. For example, while a clear and integrated data governance framework is required to provide a safe and secure environment for citizens and enterprises to transact online, laws dealing with part of the governance framework are legislated without reference to one another, and some even face constitutional challenges.

Enabling sectoral regulators to carry their mandates with industry co-operation and without ambiguity has proven difficult, as illustrated by proposed amendment bills to the Electronic Communications Act (withdrawn) and Film and Publications Board Act (heavily criticised for ambiguity). Nationally, the foundational legislation from which other regulations related to cybersecurity originate is the Electronic Communications and Transactions Act (ECTA) 2002¹⁵⁸.

¹⁵⁵ In January 2014, the DST paid the second tranche of the purchase price for satellite company Sunspace, bringing to an end the embattled company's ordeal to pay creditors. Sunspace's employees moved to the state's arms manufacturing company Denel, which has created a unit to host the IP and capabilities, based in Stellenbosch. Denel has since created Spaceteq, incorporating Sunspace, which aims to develop a multispectral, high-resolution Earth-observation satellite called EO-Sat1, for operation by 2017.

¹⁵⁶ See the Department of Science and Technology's statement. Available at: <https://www.dst.gov.za/index.php/media-room/latest-news/2800-south-africa-and-world-economic-forum-announce-intention-to-establish-4ir-affiliate-centre>

¹⁵⁷ Tshabalala S (2017) South Africa in the fourth industrial revolution: A new opportunity to create more jobs and a better society. Standard Bank. Available at: <https://corporateandinvestment.standardbank.com/CIB/About-us/Insights-Hub/South-Africa-in-the-fourth-industrial-revolution:-A-new->

¹⁵⁸ See: Electronic Communications and Transactions Act No. 25 of 2002. Available at: <https://www.gov.za/documents/electronic-communications-and-transactions-act>.

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The Regulation of Interception of Communications and Provision of Communication-related Information Act (RICA) was also promulgated in 2002.¹⁵⁹

Smart townships for smart cities

Post-apartheid policy efforts aimed at creating more sustainable and integrated districts and metros have not succeeded in reversing urban sprawl, social fragmentation, socio-economic inequality, welfare instability and extreme poverty that characterises South African cities. A combination of unmet expectations, corruption and poor service delivery have resulted in growing discontent among citizens, which have been conveyed in wide-spread service delivery protests that have put the urgent demand for spatial transformation on top of the national government's agenda.

The unevenness of digital resources in cities across the country and between them and smaller municipalities represents and compounds existing spatial inequalities shaped by apartheid legacies but now widely perpetuated by income and wealth inequality and urban mobility. These spatial patterns have produced some of the most unequal and fragmented cities in the world where affluent neighbourhoods abut overcrowded, poorly serviced townships and sprawling informal settlements.

The few initiatives that have sought to counter the compounding inequity of smart city initiatives, such as the Cape Digital Foundation's "Smart Township" initiative, have been short lived. Such initiatives provide a real alternative to the techno-utopian visions of "world-class city" "smart city" or "mega-city" projects that are ill-suited to deal with unique urban problems in many developing countries that have dominated digital transformation discourses over the last decade. A considerable body of literature has developed over this time to demonstrate that smart city initiatives in underdeveloped contexts exacerbate socio-economic inequalities, spatial segregation and public funding injustice even further.

Techno-utopian views of spatial planning not only perpetuate inequality and negate future urban buoyancy, they also disregard the user-centric, social-technical criteria that are crucial to classify a city as "smart"—where all who reside in the city are digitally connected and have greater access to employment opportunities, public services, transportation and overall better quality of life, through the use of ICT and wiser management of natural resources.

In Africa, the 'smart city' agenda found a home in the Smart Africa project led by President Paul Kagame of Rwanda, the board of which includes presidents from a dozen other countries. Kigali, already a small island of development in a sea of underdevelopment was to be the model city of this utopian vision for Africa. The irony of expenditure of billions of dollars to build largely high-end office parks and residential areas providing enhanced infrastructure to those who already had it,

¹⁵⁹ See: Regulation of Interception of Communications and Provision of Communication-related Information Act No. 70 of 2002. Available at: <https://www.gov.za/documents/regulation-interception-communications-and-provision-communication-related-information--13>

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rather than spending it on infrastructure to connect divided parts of the city, and the city to the hinterland, seems lost on politicians, government officials, development banks and futurists that flock to and mobilise resources around smart city initiatives.

With the arguably predictable failure of megacities, including Cape Town and Johannesburg in South Africa, largely as a result of their failure to address the underlying issues with the generally sporadic application of smart technologies to localised urban problems, the smart city discourse has shifted over the last decade to the building of “grandiose new landmark metropolis” such as new, built-from-scratch developments often on the peripheries of overpopulated cities such as Vision City in Rwanda, King City in Ghana, Eko Atlantic in Nigeria, Kenya’s Konza, Cairo Vision 2050 in Egypt (Watson, 2014)

Echoing this vision, President Cyril Ramaphosa in his 2020 State of the Nation Address (SONA), revealed plans for a Smart City development in Lanseria, on the outskirts of Johannesburg, highlighting the transformative potential of ICT. This comes in the context of the Presidency’s commitment to harnessing so-called 4IR technologies to make South Africa globally competitive and improve the lives of women and youth (State of the Nation Address, 2019). This R84 billion smart city development is intended to create a ‘world class city’ around Lanseria airport as an international hub consisting of upmarket commercial and residential property and creating 200 000 jobs. “It will not only be smart and 5G ready but will be a leading benchmark for green infrastructure continentally and internationally” (Ramaphosa, 2020).

Promises of a “5G-enabled smart city” appear to be framed on cities of the global North which are centred on already established efficient and innovative governments, strong institutions, a digitally equipped workforce and effective collaboration with various urban actors. In contrast, South African cities are characterised by institutional limitations, exclusionary policies, and overburdened, ill-equipped local governments. A smart city cannot be realised through decision-makers merely investing in digital infrastructure instead a concerted effort is required to ensure a smart city fully encompasses all citizens’ needs through the use of ICT.

Which is not to say that digital technologies and services cannot be deployed by local government to improve wellbeing, if it is done in such a way that prioritises the application of technologies where they can most redress the extreme inequality of service between suburban, townships and informal settings. Rather than seeking to attract the kind of foreign private sector investment needed to build a new futuristic city, a large amount of local capital could be crowded in to redress the digital and spatial inequality reflected in current South African cities and towns.

Instead of a supply-side valuation of the new mega-city, a demand side valuation of the digital demand in urban township and rural villages might divert the R84 billion or a good portion of it to supporting the development of smart townships and smart villages to redress digital inequality and enable greater social and economic inclusion. Such an integrated local government strategy

6. PRECONDITIONS AND ENABLERS OF THE DIGITAL ECONOMY - *continued*

that supports the evenness of delivery not only within cities but between them and smaller municipalities, could be a critical element of redressing digital inequality in the country.

African and Regional Harmonisation

Harmonisation of legislation, policies and regulations at the SADC level will also be important to drive digital initiatives at the regional level. The SADC process towards regional harmonisation of ICT policy and regulation is part of African Commission's effort to support harmonisation efforts of such frameworks at a continental level. SADC has grown its internal regional market considerably through deepening the integration of its policies and regulations, specifically in the e-commerce, e-transaction, data protection, and cybersecurity sectors.¹⁶⁰

More compatible and harmonised digital policy and regulatory frameworks, especially in the domain of data protection and cybersecurity, compounded with improved access to ICT, are increasing customers' confidence in e-commerce and e-transactions, and in turn leading to more regional trade of both goods and services.¹⁶¹

Nevertheless, poor implementation of policies coupled with the lack of political commitment is hampering efforts towards harmonisation of policies¹⁶². In particular, SADC is facing the following challenges to ICT policy and regulatory harmonisation:

- the existence of multiple ICT policy and programme initiatives, some of which are often in competition with one another;
- very little ownership of regional ICT policy and regulatory initiatives by national African governments; and
- few institutional mechanisms in place on the part of regional organisations and institutions to ensure compliance with model policies and frameworks, or to monitor and evaluate the implementation.

Member states belonging to SADC are sovereign states with no obligation to adopt and adjust national ICT policy and regulatory frameworks according to policy guidelines or model laws issued by regional bodies¹⁶³.

¹⁶⁰ Calandro, E., Manyame, A. & Gillwald, A. (2019), SADC data regulation case. In: Study on Unlocking the Potential for the Fourth Industrial Revolution in Africa. African Development Bank (as yet unpublished).

¹⁶¹ The SADC process towards regional harmonisation of ICT policy and regulation is part of the African Commission's effort to support harmonisation efforts of such frameworks at a continental level. An AU Reference Framework was adopted and endorsed in 2008. Subsequently, during the AU assembly in 2010, the commitment to intensify activities to implement the Reference Framework was renewed and implemented through the ITU/European Commission project on the Harmonisation of the ICT Policies in sub-Saharan Africa (HIPSSA). The first activity launched by HIPSSA and the SADC Secretariat was the review and update of the 'SADC ICT Policy and Legal Framework'. In addition, three non-binding model laws for SADC members were developed: 1) The SADC Model Law on Data Protection; 2) the SADC Model Law on Cybercrime; and 3) the SADC Model Law on Electronic Transactions & Electronic Commerce.

¹⁶² Mezghani, M. (2012). e-Commerce Readiness Study in the SADC Sub-region. Presented at the Validation Workshop (16-17 April), UNECA and SADC, Mauritius: Balaclava. Available at: <http://www1.uneca.org/Portals/6/CrossArticle/4/document/ict/Session5-strategy.pdf>

¹⁶³ Waema, T.M. (2005). A Brief History of the Development of ICT Policy in Kenya. In: FE Etta & L Elder (Eds) At the Crossroads: ICT Policy Making in East Africa. (pp. 25-43). East African Educational Publishers Ltd, Kenya: Nairobi

6. PRECONDITIONS AND ENABLERS OF THE DIGITAL ECONOMY - *continued*

The potential benefits of 4IR (for example, improved contribution to the economy and improved quality of products) and the disruptions associated with 4IR (for example, job losses and new modes of production) are apparent. The strengths of South Africa's industrial sector position it well to improve and potentially thrive in 4IR. However, much needs to be done in areas such as skills development, enabling infrastructure, and research and development innovation. The specific interventions include:

- developing digital policy that is crosscutting and that will enable the high level of integrated planning and implementation, as well as public and private sector co-ordination, required to harness the benefits of the 4IR and mitigate the risks.
- deepening public-private partnerships such as Business Processing South Africa and Harambee to align skills and create jobs in the rapidly-evolving area of business process outsourcing.
- adopting open-data policies within well-developed data protection and rights frameworks.
- implementing the stalled 4IR strategy for the public sector developed by SITA.
- strengthening the manufacturing and agricultural sectors.
- incorporating 4IR technologies into the health and education sectors.
- addressing not only the lack of digital skills but also basic education, which needs to be adapted to new and relevant ways of learning away from conventional silos.
- expanding power and broadband infrastructure capacity that is universal, stable and affordable.
- supporting commercialisation of local innovations and start-ups through microloans, hubs with subsidised bandwidth, and entrepreneurial and leadership training.

7. RECOMMENDATIONS

National Digital Policy

Government needs to develop an integrated digital policy that reflects the crosscutting nature and impact of digitisation on the economy and society as a whole. Efforts to deal with this through a high-level commission to envision our future and an integrated ministerial committee to coordinate policy formulation and implementation for the 'Fourth Industrial Revolution', may envision and identify issues but will not be able to provide the necessary coordination required. Assigning responsibility for the coordination and integration of government activity by departments or ministries with parallel authority has proved unproductive in the past.

South Africa is often described as having good policy but poor implementation. Policy is not good, if it is not appropriate to the institutional endowments or the absorptive capacity of the state, firms and citizens. Ensuring that principals (ministries) and agents (especially in the case of sector specific specialist regulators) act transparently and autonomously within their remit to implement policy but are publicly accountable for implementing policy through Parliament's oversight functions, are critical together with capacitating institutions, to ensure positive policy outcomes. It was also emphasised in the diagnostic analysis and by a number of the submissions made to the National Planning Commission, such as the Media Monitoring Africa (MMA),¹⁶⁴ that national digital policy needs to be also developed as a rights-based framework incorporating the relevant fundamental rights and freedom.

All the departments in the economic cluster identified the need for coordination of their sectoral efforts in this area. In order to develop such a diverse policy, the government will need to harness all the skills and experience of the public and private sectors, as well as those in academia and civil society. Fully inclusive multi-stakeholder consultative processes need to ensure that there is sufficient capacity to assess the inputs, weigh the evidence and develop policy in the best interests of the country and to fully comply with administrative justice.

This requires the rapid materialisation of the merged DTSP and DOC, into a technically strong DCDT that is able to work closely with the departments of science and technology, trade and international relations. The creation of an integrating, super-department, within or without the Presidency to ensure this integration and co-ordination is worth considering. This would enable government to follow through on the NDP, which sees ubiquitous broadband and Internet use as essential to inclusive participation in the global digital economy.

¹⁶⁴ Submission made by Media Monitoring Africa (MMA), and endorsed by the South African National Editors' Forum (SANEF), the Interactive Advertising Bureau of South Africa (IABSA), the Centre for Human Rights (CHR), and the Coalition on the African Declaration on Internet Rights and Freedoms (AfDec Coalition).

7. RECOMMENDATIONS - *continued*

Integrated infrastructural planning and institutional arrangements

Ensuring the critical infrastructural underpinnings of the digital economy will be essential to the success of this national project. Despite the virtual characteristics of the digital economy, it is highly dependent on high-quality, high-speed broadband infrastructure, a stable and secure supply of power and adequate transport infrastructure for delivery. These are important preconditions for 4IR to be effectively rolled out to all South Africans. The National Association of Broadcasters notes that “this does not mean that the preconditions must be addressed first before addressing 4IR realities, as 4IR technologies are already in South Africa and if not addressed now we will continue to see broadening and deepening of the ‘digital divide’. In order to move forward without further widening the digital gap, there is a need for parallel work streams to take place, to address the inequalities of the past with regard to infrastructure development, whilst at the same time ensuring that 4IR technologies, 4IR investment, 4IR skills development and 4IR job creation are being addressed”.¹⁶⁵ The primary object should indeed be universal access to the internet for everyone in South Africa.¹⁶⁶

Departments will need to ensure investment in the extent and capacity of networks necessary to meet the demands of a digital economy with manifold increases in the use, production, storage and securing of data. Integration of the planning and building of these networks needs to be optimised for efficiency, quality and reliability. Another important challenge that needs to be addressed is the lack of capacity and skills faced at the governmental level by the operators.¹⁶⁷

An integrated regulatory agency will be required to regulate competition based on the price and quality of service delivery. It will need to be fully articulated with other dimensions of critical digital infrastructure, including cybersecurity and cybercrime, that have evolved within the Justice Department and law enforcement agencies, as well as into the data protection regime required to build a trusted environment for purposes of demand stimulation and for e-commerce and e-trade. As emphasised in the diagnostic analysis, and by a number of the submissions made to the NPC such as the Black Information Technology Forum (BITF), the importance of *ex ante* regulation critical to ensuring the competitiveness of the infrastructure industry will need to be coordinated with *ex post* regulation by the Competition Commission on anti-competitive behaviour in the industry, something currently a co-jurisdictional issue for the Commission and ICASA. The demands of creating fair conditions for local service providers is going to become increasingly complex in a fast globalising environment in which global players may not be subject to local jurisdictions in which they operate and extract revenues. This is going to require dynamic and adaptive regulation that enables OTT services and innovations, which enhance consumer welfare while encouraging

¹⁶⁵ Comment from the submission of the National Association Broadcasters to the NPC on the draft of this report.

¹⁶⁶ Submission made by Media Monitoring Africa (MMA), and endorsed by the South African National Editors' Forum (SANEF), the Interactive Advertising Bureau of South Africa (IABSA), the Centre for Human Rights (CHR), and the Coalition on the African Declaration on Internet Rights and Freedoms (AfDec Coalition).

¹⁶⁷ Submission by Telkom SA.

7. RECOMMENDATIONS - *continued*

the development of local industries, and allow them to remain competitive. In order to govern the content and for government to tax revenues generated from services even if the corporation is not present in the country, will require the country to engage far more actively than it has in forums of global governance and multilateral forums dealing with cross border and jurisdictional trade. The re-integrated Department of Communications particularly will be under pressure to meet these demands, and will be playing catch-up, having spent the last five years trying to unravel the logic of convergence of broadcasting, telecommunications and IT that informed policy and law over the last two decades.

Create an enabling environment for broadband extension

The implementation of the now six-year-old proposed rapid deployment guidelines needs to proceed in haste. Despite massive investments in the sector, the country has failed to meet the 2016 targets and likely the 2020 targets as well. It is critical to determine the reasons for the slow pace and ensure that implementation is not held up by possible delays in the proposed Electronic Communications Amendment Bill or pauses for jurisdictional clarity on municipalities. The regulator needs to ensure that there is sufficient spectrum available in the necessary bands to support the shift from voice services to data services and the reduction in the cost of providing data services.

As part of the enabling process, the following actions should be considered:

- Revisit the SA Connect broadband plan and review the proposed strategies including the feasibility of leveraging private investments for public delivery through incentives of smart procurement and anchor tenancies. This could shift costly capital expenditure by government to the much-lower operational expenditure (OpEx) costs.
- Urgently proceed with the rapid deployment of broadband to create a mandatory rights of way regime.
- Employ innovative use of licensed and unlicensed spectrum.
- Align with new universal access and service strategies and assess deviations from the various strategies over the past five years. Consider developing complementary public access approaches such as free public Wi-Fi extension to rural areas to deal with extreme digital inequality.
- Assess the viability of BBI to serve operationally as the national broadband champion (SA Connect Champion) and whether the incorporation of Sentech will provide sufficient commercial relief to BBI's dire financial situation to allow the merged entity to be competitive in a market with both highly-entrenched big players, and agile smaller private players.

7. RECOMMENDATIONS - *continued*

Regulation

Market Review. ICASA must create a fair, competitive environment for the multiple players in the market by implementing the findings of its market review, and applying the necessary pro-competitive remedies, in particular with respect to entities enjoying significant market power. Although this is already happening on a commercial basis, further incentivising infrastructure sharing and wholesale regulation of facilities and bandwidth will reduce input costs for service providers and private networks. However, this requires a fair, competitive environment in which all players can compete in this relatively small market. The market review, the third commissioned by ICASA, as well as its other, as yet unpublished findings, must be urgently completed, and the necessary remedies applied to provide all licensees and market players with a stable and certain environment in which to operate. Some of the submissions to the NPC on the draft of this report also supported the need to have fair and effective competition regulations to stimulate development in the market.¹⁶⁸

Infrastructure Sharing. Complementary investments, such as in national transmission fibre, should be encouraged as part of a national strategic infrastructure plan, as should commercial infrastructure sharing, which will reduce the high costs of duplicating networks. Where practices are anti-competitive or exclude other market players, ICASA should investigate the need for mandatory infrastructure sharing at regulated cost-plus prices.

Spectrum. A review of spectrum policy will ensure more optimal co-existence of licensed and unlicensed spectrum, which will optimise spectrum for the diverse needs in the country and prioritise affordable access to communications.

This will require both demand- and supply-side spectrum valuation and resource allocation methods. While historically only the commercial value of spectrum has been recognised, demand-side valuation that recognises the public good value of spectrum for general purpose use, through public access or commons models, is equally important from an equitable public-policy perspective. Spectrum required for the evolution of existing commercial services needs to be assigned at a competitively determined (efficient-use) price to ensure the build out of capital-intensive networks benefitting from economies of scale and devices.

However, with evidence indicating that even cost-based GSM prices are not affordable to most South Africans, spectrum should be made available for secondary use. Nationally allocated spectrum not in use in rural areas must be made available through low-cost or licence-exempt spectrum for communities, non-profit providers or micro-networks.

¹⁶⁸ Submission by Telkom SA

7. RECOMMENDATIONS - *continued*

Extending unlicensed spectrum to new frequency bands can spur investment and innovation, lead to the introduction of technologies that can complement licensed networks (for example, via the hand-off from GSM to public Wi-Fi, which now also has backhaul application) and expand broadband access in low-cost, last-mile access and backhaul.

Enabling the deployment of dynamic spectrum is a critical aspect of spectrum management seeking to optimise the use of spectrum in the context of providing the exclusive use required by operators for large sunk investments, as well as the expanded licence-exempt spectrum that can reduce digital inequality by enabling access but also complementing high cost, private use.

Data governance and justice

Although there have been many initiatives in the area emanating from different departments, an integrated data governance framework, within the context of the constitutionally enshrined Bill of Rights, will be essential to developing the trusted framework required for people to use online services.

Development and implementation of data and privacy protection, open data and data access, cybersecurity, cybercrime and anti-surveillance will need to take central stage as far as governance of digital infrastructure is concerned. Coordination of the activities of various regulators in the field is critically important. The work of the Office of the Information Regulator needs to be more resourced and articulated with other content regulation. This is crucial to enable the expansion of electronic and mobile services, as well as for the protection of citizens engaging on such online platforms.

The POPI Act should be supported in its implementation and the Information Regulator sufficiently resourced, and the Cybercrime Bill needs to be implemented. While many departments are involved, there is a need to increase coordination so that the Bill is effectively deployed. Improving administrative and technological skills within the institutions will be critical to ensure the Bill's full functionality. However, for there to be data justice, a framework should be in place to prevent harm and mitigate the risks associated with the rapid expansion of digital services and large numbers of people coming online for the first time. Achieving this will require massive public awareness campaigns not only by way of digital literacy but also to raise awareness of peoples' rights that they are currently not exercising online but offline.

Rationalisation of state-owned entities

Government should implement processes to prevent multiple state-owned entities from competing with one another. It should also merge public entities into a single operation or into viable private operators who can make national assets work better. Political decisions requiring the use of state-owned entities on ideological and personal interest grounds undermine the competitive strategies

7. RECOMMENDATIONS - *continued*

adopted in policy, and make the effective regulation of the sector untenable. The rationale for the integration of BBI, Sentech and SITA needs to be made clearer and more transparent. The tendency within government, and particularly within this sector, to give additional regulatory and operational policy responsibilities to entities that are already underperforming simply sets them up for failure, unless the necessary capitalisation or strategic resources are also provided.

USAASA, the USAF and USOs

With the absorption of USAASA's regulatory functions under the proposed economic regulator, the rationality and effectiveness of having a universal service fund at all needs to be reviewed. Universal access and service mechanisms should be reassessed in the context of the increasing availability of Internet-enabled devices and multiple points of public access. Leveraging these trends to provide citizens with access to public connectivity is suggested as a complementary service to enable digital inclusion (for example, by providing free public Wi-Fi access in municipalities, schools, clinics and libraries).

The concept of pay-or-play should be extended from infrastructure and device roll-out to other contributions by operators that may generate much greater value in the digital economy, or that should be regulated as a public good, such as big data. This can be used, not only as an evidence base for the public sector but for national planning across sectors, for example, transportation.

Human development

In order to prepare for and embrace the digital economy, it is essential to develop a diverse, adaptive digitally-skilled workforce and overcome the basic educational deficit that hinders broad-based acquisition of advanced digital skills. This means building a pipeline of future talent, from primary school up to university, and in workplaces through job accelerators. Furthermore, digital literacy needs to be seen as a basic human right where investment is not reserved for academia or industry but also extended to preparing those who are digitally illiterate.¹⁶⁹ This is where government and the private sector need to foster increased digital inclusion by incentivising digital literacy education and the private sector that benefits from access to data subject information should be required to reinvest in a socially responsible manner.¹⁷⁰

Critically, the school curriculum must be revamped, not only to advance the take-up of science, technology, engineering and mathematical courses but also to promote critical thinking, flexibility and creativity. These are challenges not specific to the 4IR but they are exacerbated by its emergence. While automation and AI can replace industrial workers and clerical competencies, they cannot substitute for leadership and creativity. The workers of the future will need to be provided with 'soft' skills as well as 'hard' technical skills.

¹⁶⁹ From submission by Adv. Zanyiwe Nthatisi-Asare made to the NPC in response to the draft of this report.

¹⁷⁰ From submission by Nonhlanhla Dawn Ngwenya, LLB(WITS) to NPC in response to the draft of this report.

7. RECOMMENDATIONS - *continued*

Greater automation in industry leads to disruption and displacement in traditional commercial and industrial settings, and new forms of work will require entrepreneurial and management skills. Various ad hoc digital skills initiatives within government agencies and under the auspices of various departments need to be assessed for their suitability and cost effectiveness, and then streamlined under the appropriate departments such as basic education, tertiary and technical education, all of which, as indicated, require a fundamental overhaul. Where public universities or Technical and Vocational Education and Training (TVET) colleges are not meeting the needs of the public or private sectors, processes should be undertaken at a national level to identify these needs and ascertain how they can be met.

This will require greater cooperation in the development and delivery of programmes, as well as the development of cross-campus programmes or the establishment of multidisciplinary institutes. To encourage innovation and the multidisciplinary approach required for contemporary education and research. Cues can be taken from programs in other countries. For example, the Weizenbaum Institute of Design is a project combining different areas of expertise (from architecture and engineering to computer science and graphic design) from all the universities in Berlin who are brought together physically and virtually in a collaborative research space to undertake public interest design.

In addition to a major overhaul of formal education as a whole to adapt it to the changing environment, private sector training innovations need to be leveraged for job creation and supply-side alignment to industry demand. Furthermore, deepening public-private partnerships such as Business Process Enabling South Africa (BPESA) and Harambee are needed to align skills and create jobs in the rapidly-reviving business process outsourcing sector.

Addressing gender and racial inequality across all skill sets is also critical. In the areas of advanced technology, the gender imbalances are as high as 80-20 in favour of men, and the racial imbalances on top of this mean that there are hardly any black women working in these areas.

Digitalisation of the public sector

While South Africa scores relatively well in relation to infrastructure, financial regulation, private-sector competitiveness and innovation, on any index that rates public sector digital performance South Africa scores very poorly. A key enabling condition for an effective digital transformation is smart government which can deliver improved public value to South Africa's citizens. This requires that government focuses on operational excellence to meet the challenges of the 21st century, rather than merely technological solutions. A future-focused approach, which assumes anticipatory and iterative forms of governance and regulation while maintaining a commitment to collaboration and co-creation with multiple stakeholders for enhanced public value, is necessary. A smart government orientation will allow the public sector to play a more active and direct role in fostering innovation by enhancing its 'productive capacity and capabilities'; it will direct public

7. RECOMMENDATIONS - *continued*

value creation through a collective process to manage the complex public policy challenges that emerge through technological transformation.¹⁷¹

Digitalisation of the public sector should be speeded up to improve interdepartmental communication as well as the efficiency and effectiveness of service provision in education, health, social welfare and other sectors. The success of the State IT Agency's new integrated enterprise model will depend on a massive change-management (skills and mindset) exercise not only within the moribund State IT Agency but also across the public sector. Ensuring that this plan is instituted effectively, having been scheduled but not heard by Parliament before the close of the last administration, is a priority and vitally important.

Open data and consolidated national indicators

No government (or any other entity in the information age) can function without data – for policy formulation, planning, monitoring and evaluation. Various portfolio organisations require information and data for evidence-based planning and implementation, as does the government for policy formulation.

Currently, government departments, public agencies and universities are paying other state agencies for data if they have it. Many such entities also have appropriate research functions related to their mandate. Some have statutory or treaty obligations to collect and report data at the national level to international bodies, particularly the UN and the ITU but little of this finds its way into the public domain.

There is a core set of indicators that all organisations require, and all have identified the need for demand-side data (via nationally representative surveys) to supplement administrative supply-side data and the limited set of ICT indicators from the census and the annual national household survey conducted by Stats SA. Historically, all data has been collected on an ad hoc basis when resources could be secured. This needs to be regularised, standardised and institutionalised.

An integrated and coordinated data-gathering procedure for the sector, and for ICT across sectors, is required that clearly allocates responsibilities for the collection of data and makes this publicly available on a national indicators data portal, with the underlying dataset available according to open-data access principles.

This needs to be framed within the context of an open-data policy that safeguards privacy rights and which enables the free flow of information required for more effective planning by government and service delivery entities, and to increase the uptake of online rather than face-

¹⁷¹ Mazzucato, M. & Ryan Collins, J. (2019). Putting value creation back into public value: From market fixing to market shaping. UCL Institute for Innovation and Public Purpose Working Paper, No. 5. Referenced in submission made by Dr Rushil Ranchod, Associate Director, Relational Wellbeing Collaborative, to NPC in response to the draft of this report.

7. RECOMMENDATIONS - *continued*

to-face transactions. Importantly, reliable public data can fuel entrepreneurialism and innovation, especially for SMMEs and start-ups who do not have their own big data to leverage for commercial application.

Integrated multidisciplinary research and innovation system

An integrated multidisciplinary research and innovation system is required to deal with the crosscutting nature of digitisation. State support through the NRF and DST for research in technology and innovation has been focused on STEM research in the public universities and industrial and social councils. As much-needed as such research is, and even though the motivation of the research is often couched in redressing inequality, alleviating poverty and creating employment, the lack of multidiscipline or different disciplines required to address these issues means that while the outputs may be academically rigorous or publishable in a particular field, they are not able to feed practically into policy or planning.

Government consulting in these areas has also been focused on the research councils, often resulting in technical outputs on issues such as spectrum allocation or indicator mapping, without any business plan or financial viability assessment. For research to feed into policy processes, in particular, requires specialised, multidisciplinary investigations that can draw on international experience but which are also locally contextualised. There is currently scant support or efforts to institutionalise such research and training in South African universities.

Processes should be developed to publicly identify the digital policy needs of government and then public institutions can be funded to develop research agendas individually and collectively in support of those needs. While there have been millions of Rands of public investment in technology and innovation, there has been almost no public investment in digital policy. Various initiatives over the year have been made possible by donor funding, with the associated peripatetic funding associated with that. Rather than spending millions of Rands on the WEF C4IR, that funding should be channelled to the NRF for driving local digital policy research and digital data collection required for local, evidence based policy. This should enable South Africa to better develop and future-proof some of its costly policy processes. Research projects that cut across universities and university programmes should be encouraged, as should science councils.

Regional harmonisation

There is a need to adapt personal data compliance frameworks to be in line with a number of international and regional regulations and technological advancements. While this is a difficult task, it requires coordination at all levels (national, regional and international), cooperation with international and regional partners, resources and political will. The harmonisation of the continent's digital identity systems and digital payment systems must be the unifying factor, especially as the AfCFTA aims to create a single continent-wide market for goods and services and to promote

7. RECOMMENDATIONS - *continued*

the movement of capital and natural persons. Furthermore, there is a need for increased regional and continental cooperation regarding the promotion of Africa's market needs - and nuances the advantageous bargaining power a combined African voice has as a consumer in the relationship with suppliers.

In order to promote international compatibility, it is important to avoid fragmentation and duplication in the regional and international approaches to data protection. Therefore, it is recommended that global and regional organisations focus on unifying initiatives that are internationally compatible, instead of pursuing multiple endeavours.

Global governance

With the digitisation of communications technologies, together with the mutually reinforcing liberalisation of markets that has driven the rise of global markets and players, there is increased recognition of the need for far greater governance of increasingly global public goods (e.g., UN HLPDC, 2019) such as the Internet. The rise of the Internet as a global public good required for global trade, financial and information flows, requires new forms of global cooperation to effectively govern the data and content being generated exponentially on it.

Various interests driving Internet governance understand that global public goods emerge, in large measure, in response to the extent to which countries can help to produce them at the national level. Governments of mature economies see and respond to the Internet as a strategic good, which can only be defended through implementation at a national level.

Yet, the current global governance consensus does not operate primarily through national sovereign state membership in the manner that UN bodies, such as the ITU, traditionally have. Challenges of global governance lie in the increasing complexity and adaptiveness of the global communications system over which nation-states, and particularly developing countries, appear to have little control. For many developed economies and democracies, Internet governance including cybersecurity, is very high up on the agenda of International Affairs ministers. Much greater integration of international affairs, trade and communications departments, is required to promote South Africa together with its various partners in matters of global governance, including digital trade, global taxation initiatives of digital platforms, data governance and technical governance of the Internet.

8. INTERVIEWS

Mlamli Boo, CEO Sentech, 4 May 2019

Graham de Vries, Executive: Legal and Regulatory Affairs, MTN, 14 April 2019

Barry Dwolatzky, founder of the Tshimologong Precinct tech hub

Christopher Geerdts, former WAPA chair, 25 March 2019

Lucas Gumbi, Business Development, CSIR, responsible for WEF Internet for All Infrastructure Mapping, 15 March 2019

Evan Jones, Business Process Enabling South Africa (BPESA), 26 April 2019

Derek Kotze, Chief Executive Officer: MLabs, 17 April 2019

Dr Phil Mjwara, Director General: Department of Science and Technology, 15 April 2019

Nkateko Nyoka, Chief Officer: Legal and Regulatory Affairs, Vodacom, 14 March 2019

Phatang Nkhereanye, Head: Legal and regulatory, Broadband Infracore, 19 March 2019

Robert Nkuna, Director General: Department of Communications, 25 April 2019

Dr Naledi Pandor, (former Minister of Higher Education, 4 April 2019

Kobus Roux, Meraka Institute, CSIR, 15 April 2019

Mike Silber, Executive Legal & Regulatory, Liquid Telecom, 23 March 2019

Dr Setumo Mohapi, (former) Chief Executive Officer: SITA 30 April 2019

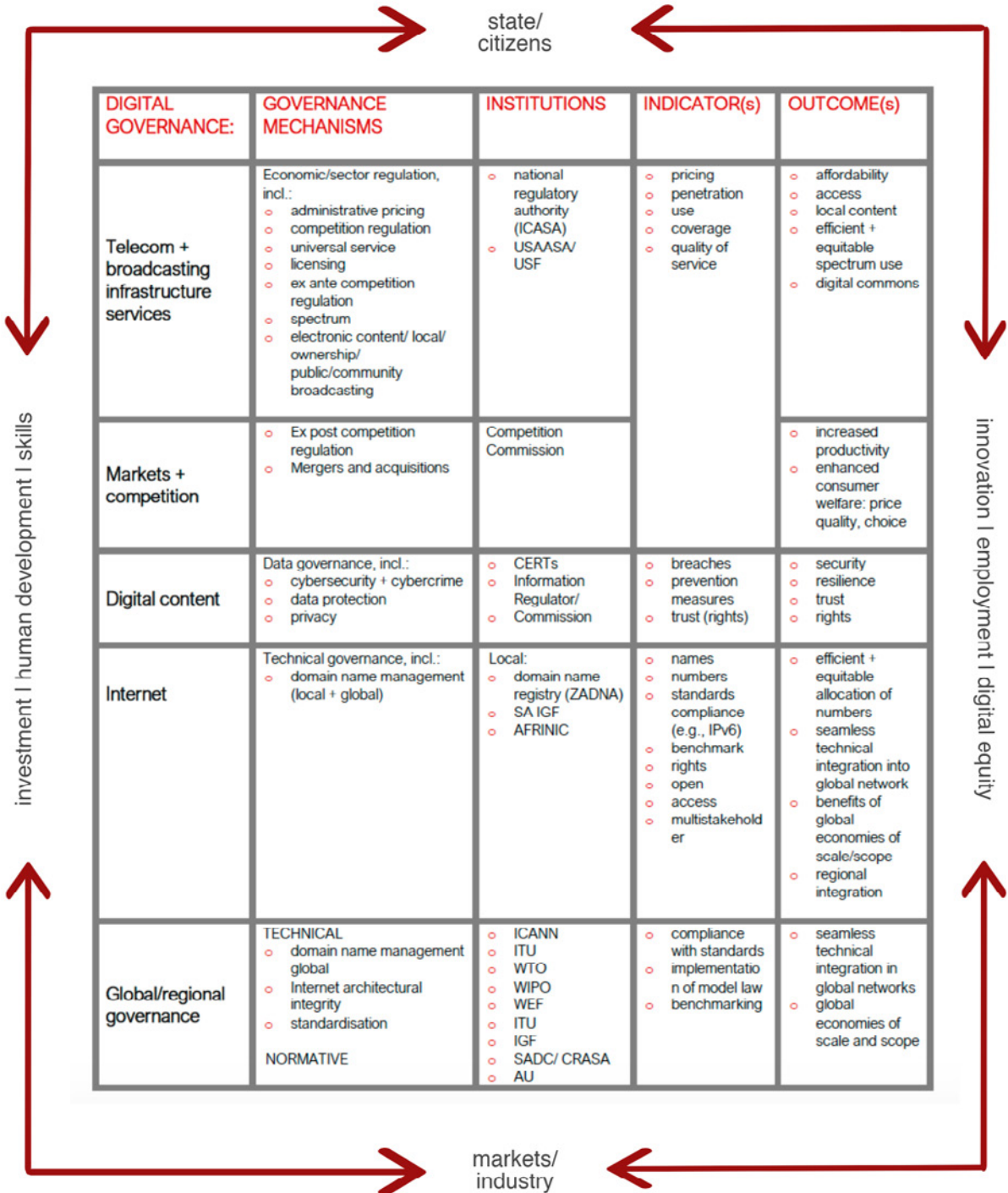
Sipho Maseko, CEO: Telkom, 15 April 2019

Carlos Rey Moreno, Zenzeleni Community Network, 30 January 2019

Willington Ngwepe, Chief Executive Officer, ICASA, 4 April 2019

Robert Urquhart, Research Head, Harambee, youth accelerator, May 2019

9. APPENDIX I





**national planning
commission**

Department:
The Presidency
REPUBLIC OF SOUTH AFRICA



DIGITAL FUTURES: SOUTH AFRICA'S DIGITAL READINESS FOR THE 'FOURTH INDUSTRIAL REVOLUTION'

