Future of Work in South Africa
The Road to 2030

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1 INTRODUCTION

The world’s dependence on technology has permeated throughout society and impacts all sectors of the economy. The implications of the rapidly advancing digital economy differ widely for the connected and disconnected populations of the world. Importantly, the manner in which this impact is realised across the developed, emerging and developing worlds varies given the country’s socio-political dynamics. This impact further manifests disparately in a country of high inequality, such as South Africa. Multiple factors indicate that South Africa’s digital divide follows from the trends of income and skills inequality pervasive within the country. Recognising this divide is crucial when attempting to project the country’s current technological and social trajectory and to thereafter define appropriate policies in line with this projection.

This study aims to explain South Africa’s technological and social positions, given the country’s socio-political history and present a view of where the country is likely to be by the year 2030. This prediction is informed through the collective inputs of multiple research stakeholders interested in exploring the country’s position in terms of digital transformation, the barriers it must overcome and the drivers of change which can be leveraged to support reaching a position of better social cohesion and technological advancement.

In early 2018, South Africa’s newly inaugurated President Cyril Ramaphosa, announced in his first State of the Nation address, that the country will launch a Digital Industrial Revolution Commission, comprising of key policy makers from across the government (Ramaphosa, 2018). This decision recognised the influence that digital technologies are making across the world, which necessitates a broader and more coordinated approach to managing and leveraging the impact of such technologies. Importantly, it is expected that the commission will also engage broadly with civil society and the private sector, appreciating that public-private partnerships are key to ensuring polices are crafted in a more inclusive manner. This presents an opportunity for policy researchers in this space to engage directly with government. In light of this opportunity, this study presents an introductory view of potential drivers of change. Further research is required to explore these levers to better understand how best they can be applied.

Various government initiatives are underway which could benefit from further research into digital trends specific to the South African context. For example, the Department of Trade and Industry has set up a Future Industrial Production Unit which is currently exploring the digitisation priorities relevant to the country’s National Development Plan and Agenda 2030. Accordingly, the department is working towards
implementing such initiatives in the short to medium term. The Department of Science Technology has prioritised the Science, Technology, Engineering and Mathematics field expecting that these fields will be a driver for economic growth and provide a knowledge base for the country to develop innovative solutions to the problems of poverty (Department of Science and Technology (DST), 2017). Given this expectation, close consideration is required of how such initiatives can be constructed in a manner which fosters inclusive development. The Department of Higher Education and Training will be convening a multi-sectoral task team to investigate what research, teaching and applications of emergent technologies are needed to develop the capabilities of the higher education sector (Gerber, 2018). Further, the Department of Telecommunications and Postal Services is managing inter-departmental processes via a Digital Transformation Committee and is supported by the Department of Science and Technology and the Department of Trade and Industry, to explore policy options pertaining to the influence of digitalisation (Department of Telecommunications and Postal Services, 2017). The intention of this committee is to identify pathways for the country to achieve digital transformation by promoting a digital society and a productive knowledge economy by 2030. The Academy of Science of South Africa, via its Humanities Standing Committee, is commissioning a study on the 4IR, and will also explore opportunities for centralising the humanities sector within digitalisation research. The Department of International Relations and Cooperation is coordinating multilateral research engagements which prioritise the 4th Industrial Revolution’s influence on society, where for example, amongst other regional and global initiatives, themed the recent South African lead BRICS 2018 Summit as “BRICS in Africa: Collaboration for Inclusive Growth and Shared Prosperity in the 4th Industrial Revolution” (BRICS Heads of State, 2018). The National Technology Implementation Platform under the stewardship of the Department of Trade and Industry is developing a fully-fledged 4IR programme with a goal of promoting the competitiveness of the manufacturing sector in the country (SA Government News, 2018).

Given these multiple initiatives underway, evidence-based research is key to ensuring that the policies implemented within the country follow from our local context and in South Africa, we guard against constructing policy informed by international policy trends, which may be inappropriate for this country’s unique context. The impact and benefits attributed to technological change in the developed world cannot be assumed to be applicable in the South African context. Although, there are various debates whether the world is indeed transitioning through the 3rd, 4th or 5th Industrial revolution, the impact of technological change has direct implications for the way businesses and society function, resulting in potentially radical labour market changes. Further, considering the influence of inequalities within the
economy, low, middle- and high-income households will experience different levels of technology impact based on their varied capabilities. South African policy must be cognisant of these realities.

The extent of labour market consequences arising from an industrial revolution remains unknown, particularly at domestic levels. For this reason, it is important to examine the labour market consequences of the ‘fourth industrial revolution’ within the history of South Africa. South Africa’s internal dynamics are unique and follow from an unjust and divided past. In a country which is recognised as one of the most unequal in the world, international trends pertaining to digital diffusion, the means of access, digital skills and the influence of cultural norms do not apply.

The questions that emerge, particularly for South Africa, include whether technological advancement could improve or impede social cohesion. This requires that we ask whether the narratives pertaining to the benefits of technology leapfrogging are applicable, particularly within the rural areas of the country, and are the digital services offered and assessible to poor communities sufficient to replace the traditional alternative service. In this light of these questions and the South African context, this study explores the relationship between social cohesion and technological advancement, and the possible implications it has for South Africa’s future labour market.
2 APPROACH

The South African research team adapted the Delphi technique in collecting inputs from researchers and industry experts in a structured manner. To do so, an online forum was set up using Google Groups. This forum was divided into 5 partitions for, viz.: Scenario 1 - Low Social Cohesion and Low Technology Advancement, Scenario 2 - Low Social Cohesion and High Technology Advancement, Scenario 3 - High Social Cohesion and Low Technology Advancement, Scenario 4 - High Social Cohesion and High Technology Advancement and lastly, a partition dedicated to collecting general information from the study’s participants related to technological change and the Digital Divide.

*Figure 1 - 4 Scenarios - Social Cohesion vs Technology Advancement*

Each of the 4 scenarios, asked 10 open-ended questions, specific to the scenario. This included questions pertaining to (1) the description of the world and South Africa specifically in 2030, (2) an exploration of the country’s transition from its current circumstance to the outcome identified in the scenario, (3) a discussion of labour productivity in particular sectors, (4) an exploration of the disparities in the workforce by 2030, (5) an examination of employment conditions and how they evolved by 2030, (6) a discussion of how the economy evolved, (7/8) an examination of worker and employer policies required in such a scenario, (9) an exploration of the requirements of workers of the future and lastly (10) a discussion of employer needs in 2030. Each of these questions were scenario specific and respondents were urged to
imagine a South Africa in 2030 that would manifest such changes and attempt to identify the drivers of such change. Some respondents preferred to concentrate their inputs on the scenario they considered most likely, whilst others imagined how such outcomes could potentially become a reality.

The online Future of Work forum was launched at a Monitoring and Evaluation Community of Practice meeting, held quarterly by the Council for Scientific and Industrial Research. The Community of Practice brought together technology and data collection experts from the government and business sector. The launch of the forum involved a presentation and discussion of key issues affecting South Africa in terms of the current Digital Divide and its potential impact on the country in reaching any of the four scenarios mentioned above. These experts were invited to respond to the questions within the forum and also invite their colleagues to participate. Thereafter, additional experts from the research and business sectors were invited to contribute to the discussion. In addition, a follow up online Q&A session was held to answer questions participants had and to also further the discussion. The respondents’ inputs are captured on the online forum, whilst other points mentioned during discussions (but not captured online) were recorded and also contribute to the output of the study. Furthermore, discussions with researchers from the Human Sciences Research Council, Global Economic Governance (GEG) Africa and Nelson Mandela University were held to test the views of the online group. These discussions were documented and contribute to the findings captured within this report.
3 SOCIAL COHESION IN SOUTH AFRICA

In the context of this study, a loose and inclusive definition of Social Cohesion is adopted to ensure that the study considers as broad a range of social factors applicable to South Africa. As a broad umbrella term to describe social conditions within South Africa, this term refers to a multitude of factors such as living conditions, access to services, income inequality, poverty, employment opportunities, wellbeing, crime, violence, gender conflicts, mistrust across the population and feeling secure. Such a broad definition is necessary as technology advancements have the potential to influence all aspects of society, in ways possibly not understood at this moment. Furthermore, these factors are interconnected and are not easily distinguishable.

To better understand these factors, consider the following:

3.1 INEQUALITY

Considering South Africa’s Gini-coefficient of 0.63 as reported by the World Bank in 2017, South Africa is recognised as one of the most highly unequal countries in the world (The World Bank, 2018). In its review of the South African Economy, the World Bank advises that the country must focus on education centric policies to overcome the effects of inequality proposing that through an improved education platform, the workforce would support growth via increased competition and skilled migration. Income inequality in South Africa, is possibly the most difficult challenge the country has to overcome. The UN Human Development Report (United Nations, 2010) and the UN Habitat study of 2010/2011 titled “State of the World Cities” referred to income inequalities at city level in identified that the top 9 most unequal cities were found in South Africa (UN Habitat, 2010). These statistics reflective the pervasive nature of inequality in the country.
Figure 2 - Top 10 most unequal cities in the world.

![Global Urban Income and Social Inequalities](image)

Source: UN HDR 2010 & UN Habitat 2010/2011

Figure 3 - Urban Inequalities (consumption/income) in selected cities and countries in Africa (1993-2007)

![Urban Inequality Map](image)

Source: UN Habitat 2010/2011
Bhorat & Van Der Westhuizen (2012) highlight these trends in their study and noted that income inequality in the country was widening the gaps between rich and poor. The key determinants of these trends were the historic inequities within South African society, and inability of the country's policies to adequately address these challenges. The authors note that these trends 'threaten the survival of democracy' and that the current growth pattern of the country will not address these inequalities and may only result in modest gains. The trends suggest that inequalities are widening across racial lines which tends to exacerbate the racial tensions conceived during South Africa’s Apartheid era. Further, it is noted how inequality impedes voter participation, political engagement and increases the rate of crime. Similarly, the Mapungubwe Institute for Strategic Reflection's study referred to the consequences of poverty on society and noted the ills which accompany high inequality and outlined crime, poor education and teenage pregnancy as such consequences (Netshitenzhe, 2013). The Mapungubwe study noted that one should consider determinants such as the access that the poor have to assets, services and opportunities, and social capital. Thus, if nothing is done to promote such determinants, despite the already high levels of inequality, it could worsen.

One of the most urgent and dire consequences of inequality, is the impact it has on violent crime. Wilkinson (2004) reports that inequality is a predictor of violent crime in a country. In his study, he describes how such disparities directly influence the health of society. Neglecting the effects of inequality, results in a divided population which becomes more insensitive to the plight of the disadvantaged, which in turn has socially corrosive effect. The net effect of this results in those afflicted by poverty finding property crime more attractive and ultimately profitable as a livelihood. The disparities between rich and poor emphasises the frustrations experienced by the poor, exacerbates the hostility between such income groups and permeates a feeling of hopelessness. Increased experiences of violent crime further undermines trust amongst people, impedes community engagements and over time destroys the functioning of institutional and social structures. In South Africa, income inequality is closely aligned to racial categories, where efforts of the post-Apartheid government have had a limited impact on reducing poverty. Hence, racial tensions remain high. In reviewing income inequality, wealth inequality and the reported murder rate, in 2018, it was reported that the murder rate has increased by 6% to 36%, from a low point in 2011. The steady incline corresponds to the stagnant income inequality Gini coefficient of almost 0.7% which shows no impetus of decreasing considering the country’s policy outlook in the short to medium term. In addition, given a calculated wealth inequality co-efficient of 0.95, it was found that 10% of the country’s population control at least 90 to 95% of all wealth, highlighting the country is actually more unequal than expected if one only considers income inequality (Orthofer, 2016).
By reflecting on such statistics, it is indicative that the rising levels of violent crime is related to a frustrated and hopeless population.

*Figure 4 – Murder rate vs Income inequality and Wealth inequality*

Income inequalities also closely correspond with access to digital tools and the internet in South Africa. Using data from the General Household Survey (GHS) of 2015, it is found when internet access is viewed in terms of monthly income bands, 84% of those in the highest income quintile have internet access in contrast, to those in the lowest quintile where less than 35% have such access (Statistics South Africa, 2017a). The challenge this highlights, is that poorer households have insufficient disposable income to spend on internet access and must first attend to their basic necessities.

*Table 1 - Internet access per monthly income band*

<table>
<thead>
<tr>
<th>Internet Connection / South African Household/ Income Band (ZAR)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 1500 (ZAR)</td>
<td>34.7%</td>
</tr>
<tr>
<td>Between 1501 – 3500 (ZAR)</td>
<td>40.6%</td>
</tr>
<tr>
<td>Between 3501 – 7500 (ZAR)</td>
<td>56.6%</td>
</tr>
<tr>
<td>Between 7501 – 12500 (ZAR)</td>
<td>72.6%</td>
</tr>
<tr>
<td>Above 12501</td>
<td>84.2%</td>
</tr>
</tbody>
</table>

*Source: GHS 2015, Statistics South Africa*
The study’s respondents referred to these trends and identified the link between income inequality and technology diffusion in the country as a central driver of change. Respondents noted that if the country does not recognise how the current policy environment drives these trends, inequality would worsen, resulting in the shrinking of South African middle-income earners and growth amongst poor which would in-turn exacerbate feelings of mistrust and discontent.

### 3.2 Poverty

Since 2012, poverty in South Africa can be described in 3 different categories, viz food poverty, lower-bound poverty and upper-bound poverty. Food poverty is calculated by following a cost-of-basic-needs approach, by assuming people in this group only have the financial means to afford a selection of basic foods. Those included within the lower-bound poverty group earn sufficient income to afford the selection of basic foods in addition to a selection of basic non-food items. People in this group are not completely able to afford an adequate amount food and non-food items and must therefore sacrifice some non-food items. The upper bound poverty line is calculated based on an assumption of the cost of an adequate level of food and non-food items to sustain one’s self. Each year, these poverty lines are adjusted based on the annual inflation rate (Statistics South Africa, 2017b). For perspective, as at April 2015, the food poverty line amounted to $1.22 per day, the lower bound poverty line equalled $1.79 per day and the upper bound poverty line was approximately $2.75 per day.

*Figure 5 – Levels of Poverty in South Africa (2006, 2009, 2011, 2015)*

Generally, poverty trends in terms of race and gender have remained relatively stable. The African population group has had the largest proportion of people living below the lower-bound poverty line with...
44.8% of males and 49.2% of female living in poverty. In contrast, the proportion of the White population group living in poverty amounted to approximately 0.5% for both males and females in 2015 (Statistics South Africa, 2017b). As discussed, these stark discrepancies tend to further exacerbate racial tensions within the country. From a household perspective, 40% of households in 2015 lived below the upper-bound poverty line, which was also an increase of 1.7% from 2011. In addition, half of female headed households lived below the upper-bound poverty line, in contrast to 33% of male headed households. In addition, the most vulnerable age groups are households headed by youths between 0 and 17 years old, as well as the elderly above 65 years of age. The 0 to 17 age group reflected 59% of such households living below the upper-bound poverty lines, whilst 45.6% of those households headed by persons 65 years and older experienced living below the upper-bound poverty line. This percentage has decreased substantially from 2006 where 68% of such households lived under the upper-bound poverty level, indicating the value of old-age social protection programmes.

Poor households (upper-bound poverty) on average earn approximately R46,000 per annum and spend an average of R31,000 per annum. On average these poor households direct 64% of their expenditure to basic necessities such as food, housing and transport. The remaining 36% of expenditure is directed to miscellaneous priority items for the household. It is also important to note the average household size is 5.1 for poor households, which is more than twice the household size of non-poor households with an average size of 2.4 (Statistics South Africa, 2017b). Given the size of the household, competing interests in the household often lead to many poor households not finding internet access as relevant or necessary expenditure.
3.3 **Unemployment**

As at June 2018, the conservative unemployment rate in South Africa was 27.2% whilst the expanded unemployment rate (which includes the not-economically active) amounted to 37.2% of the population (Statistics South Africa, 2018). A shrinking middle class and high rate of inequality is rooted in the country’s poor employment opportunities, particularly amongst the youth. Youth unemployment (using the conservative estimate) is much higher than the average across age groups and compared to adults. As at 2018, 39% of youth were unemployed. This is coupled with a poorly performing education system where it was noted that as at 2011 approximately only 29% of adults had completed formal secondary schooling. Thus, the majority of adults had dropped out of school before completion.

South Africa’s high rate of youth unemployment is closely linked to the country’s poorly performing education system. South Africa’s schools have been categorised into quintiles based on a variety of factors but largely underpinned by the surrounding community’s average income. Often schools in poorer areas have produced weaker results and are impacted with higher levels of learners dropping out from school. As described in the diagram below, these environmental factors lead to learners living in poorer areas either not finding any work or filling low skilled and non-productive jobs. In contrast, learners from more affluent areas tend to produce better results after receiving better schooling, thereafter gain access to tertiary education and enter into more productive jobs, given their qualifications. Such trends perpetuate...
a cycle of hereditary poverty linked to the poorly performing education system and unemployment trends. Breaking this cycle will be key, to improving the country’s state of social cohesion (Spaull, 2015).

Figure 7 – The links between society, the education System and the labour market

Source: Spaull (2015)

In addition, not all learners who complete school have received adequate training to work with digital tools. The study participants also noted the following challenges which are experienced in the current education system.

1) A lack of alignment between the school curriculum and university prerequisites, pertaining to subjects which are ICT related.

2) A lack of alignment between skills offered by tertiary education facilities and training programmes, in comparison to the needs of employers.

3) A lack of recognition for some certifications of achievement, despite the value and effort in acquiring such an award.
4) There is limited effort by government to absorb/educate the large number of school dropouts and unemployed.

5) More productive jobs are filled by the more affluent portions of the population who are able to afford private training targeted to the needs of employers.

Ultimately, the benefits of internet connectivity or technology advancement are largely available only to the minority of the population, whom have the financial means, have attended schools with greater technology adoption and are able to apply their skills in the work environment. Without a concerted effort by policy makers to address these disparities, the inequalities in technology access will worsen. These trends are foreseen to harmfully impact employment opportunities in the country. The more difficult it is to access the internet or digital tools within schools, the less effective will be South Africa’s education system. This impacts the extent to which learners can contribute innovatively to new fields of technology and the competitiveness of the country’s businesses and future innovation prospects.

3.4 THE NEOLIBERAL POLICY APPROACH

During the discourse of the Thabo Mbeki presidency, South Africa consolidated the Growth, Employment and Redistribution (GEAR) policy, which adopted a series of measures including fiscal austerity, export oriented production and public sector privatization. The policy replaced the Reconstruction and Development Programme (RDP) instituted during the initial years of the Nelson Mandela presidency. The expectation was that the policy would promote an economic growth target of 6% annually and the creation of 400,000 jobs per annum (Department of Finance, 2002). In hindsight, these targets were not reached.

The study participants strongly criticized the neoliberal policy approach of GEAR, stating that the policy framework has consequently negated the country’s developmental trajectory. The challenge of pervasive inequality in the country can be attributed to this policy, which assumed social benefits would result as a by-product of business growth. In implementing the policy framework, the country began to emphasise the export of goods of services, free trade and arguably neglected of social service provision. The gains experienced by businesses have not translated into benefits received by the labour force in terms of greater employment opportunities, improved education performance or a reduction in poverty. In fact, in actual terms, the opposite has been found to be true, despite claims from the ruling party that the introduction of such policies could be seen to be a new vehicle which should fulfil the developmental aims proposed by the RDP approach.
To provide further context to this argument, the RDP was able articulate the aspirations of a unified and developmental South Africa. Growth and development would be promoted through a mixed Keynesian framework advocating for both development through reconstruction programmes and growth through market mechanisms. However, once the RDP had been replaced by GEAR, the developmental agenda was minimised, and a series of initiatives were introduced such as relaxed exchange controls, trade liberalization flexible labour market controls and interest rate-based market stabilization monetary policies. Such policies allowed the private sector to take economic control. This happened at the expense of the poor, where the net effect was a transfer wealth from the poor to the already rich. Ultimately, these trends perpetuated and worsened the effects of inequality (Sebake, 2017).

Steven Klees argues that the South African policy approach of GEAR resembles that of Reagan’s United States and Thatcher’s United Kingdom in the 1980s (Klees, 2014). Klees, citing the work of Vally and Motala, states the only common ground that left-leaning policy advocates share with neoliberal views is the emphasis on effective education programmes. However, as supported by Klees, the neoliberal view of privatising social functions promoted deeper inequalities which has led to the current employment crisis.

It was argued by the study participants, that under the current policy approach, businesses have no incentive to promote skills development and employment creation programmes. Accordingly, one can expect that technology advancement and automation in particular, will have a destructive effect on the labour market within the manufacturing and services sector. A policy change is needed to incentivise skills development and public private partnerships in a manner which can grow the labour force in areas of most need. If the policy framework is left unattended, businesses will find a new state of equilibrium through an emphasis on exports, outsourcing and limited local employment.

### 3.5 Oligopolistic Competition in South Africa

Oligopolistic competition occurs when products/services are traded in an environment where the barriers to entry are very high. Given the low state of competition in such a market, the existing companies have the power to dictate the pricing of the traded goods/services, whilst continuing to dominate the market, despite possible exorbitant pricing. Such a situation aptly describes various sectors of the South African economy, such as banking, retail, insurance, transport, telecommunication and manufacturing (Pienaar, 2017).
The Competition Commission in South Africa is tasked to find solutions to de-concentrate control of certain sections of the economy and to identify reasons for the high barriers to entry. Despite this requirement, the Competition Commission has little powers to challenge the status-quo in South Africa (Ntingi, 2017). Theron identifies the following reasons within the South African economy why oligopolies are able to manifest. These includes a difficult regulatory requirement, unorganised and uninformed consumers and economies of scale favouring the early entrants to the market (Theron, 2006).

In review of the country’s economy, the World Bank argues South Africa’s poor economic performance is linked to limited innovation following from an uncompetitive market. The World Bank further declares that innovative practices in the gold mining, social housing and machinery equipment sectors will have productivity gains together with positive impacts on job creation. Similarly, innovations introduced within public transportation, energy, food, beverages and textiles is expected to reduce the effects of poverty (Creamer, 2017).

Advocating for the benefits of innovation is not new within South Africa. Blankley and Moses in 2009 highlighted the acceptance that innovation is vital for economic growth and competition across the global economy (Blankley & Moses, 2009). However, in 2016, the Centre for Competition Regulation and Economic Development at the University of Johannesburg, continues to argue for revisions to competition law to breakup cartels in order to facilitate the lowering of pricing of products for consumers. The centre calls for regulating within the aim of promoting competitive rivalry, amending the Competition Act and promoting sources of venture capital for small business which the centre believes can restructure the economy. Furthermore state sponsored monopolies in the form of Telkom and SAA have gravely harmed broadband rollout and air-transport in the country respectively (Roberts, 2016).

The study participants have argued that positive change in terms of market competition is unlikely whilst there are no incentives to drive the de-concentration of markets in the country. Further the group argues that neoliberal policies in effect promote and consolidate the gains of big business and make it harder for small business to gain entry or compete. Given the pessimistic outlook of the study participants, it is unclear which lever could be manipulated to promote competition and innovation in the country.
4 TECHNOLOGY ADVANCEMENT IN SOUTH AFRICA

For digital technologies to benefit from a strong foundation able to sustain innovations, there is a school of thought that argues that the Maslow Hierarchy of Needs, aptly describes the necessary foundation required for technologies to be built upon. Within such a framework, innovation is only possible if the business is well supported. To this end Jim Link describes the 5 levels of the Maslow framework from a business and technology perspective. This framework is useful in helping one understand a scale necessary to project technology advancement. On such a scale, basic technologies fall within the physiological and safety space, whilst, more advanced technologies such activities which fall within the belonging, esteem and self-actualisation space.

- In describing the physiological level for digital need, Link compares this to foundational requirements of access, such as access to digital tools and networking capability which provides one the basic necessities to function within a digital environment. Such requirements are comparable to basic needs such as food, air and water for survival.
- The safety level refers to one’s ability to feel safe within the work environment. This includes network security processes and identity protections which allow a worker to feel safe when conducting their duties.
- The belonging level includes technologies which allow workers to connect with their peers and those outside of their organisation in secure manner. This involves technologies which support communication and collaboration when in-person contact is not feasible.
- The esteem level refers to a worker’s ability to build their own technical capabilities such as digital skills, to ensure they are able to deliver on their duties in a changing work environment.
- At the top of the Maslow pyramid we find the self-actualisation level which supports the employees to ably carry out all their duties in a meaningful and creative manner. It is within this space that digital innovations thrive, but can only happen if the foundational systems are in place to support the employee (Link, 2018).
Within the innovation space, businesses are able to adopt new digital tools in innovative ways to promote the efficiency and effectiveness of the product/service that they offer. Hinchcliffe (2014) notes that digital tool advancements available in the home, actually outpace those that are available and adopted within the workspace. This is because businesses are finding it more difficult to adopt the bleeding edge devices and change their existing building models. Given this lead time, before some technologies are adopted, businesses have a short amount of time to react to the potential innovative opportunities available from new technologies. Thus, technologies which are adopted by businesses in the innovation space include the types of devices which can be utilised by workers, the applications appropriate to those devices and the business models which are thereafter changed to leverage these new applications. The more innovative businesses/entrepreneurs are able to develop an altogether new device/application given their knowledge of the environment and their understanding of what technologies could offer their particular sector.
In terms of South Africa’s infrastructure as a country, the World Economic Forum released the Network Readiness Index wherein it ranked South Africa as 65th out of 139 countries. South Africa scored of 4.2 out of a maximum 7 points which followed from a strong mobile network coverage and internet bandwidth but also very weak social impact. Social impact is informed by factors such as internet access in schools,
ICT use in government efficiency, ICT’s role in the provision of basic services and e-participation in the country (The World Economic Forum, 2016).

In terms of technology access, the Independent Communications Authority of South Africa (ICASA), reports that in 2016, 87% of households had access to either a cellular phone or landline. Furthermore, 59% of households have a household member who is able to access the internet from some location (be it at home, work, library, internet café, etc), whilst only 9.5% of households had internet access in the household (Independent Communications Authority of South Africa, 2018).  

Table 2 – Internet access by place of access, geotype and province (2016)

<table>
<thead>
<tr>
<th>Place of access</th>
<th>Geotype</th>
<th>WC</th>
<th>EC</th>
<th>NC</th>
<th>FS</th>
<th>KZN</th>
<th>NW</th>
<th>GP</th>
<th>MP</th>
<th>LP</th>
<th>RSA</th>
</tr>
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<tbody>
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<td>At home</td>
<td>Metro</td>
<td>27.3</td>
<td>6.8</td>
<td>NA</td>
<td>8.2</td>
<td>9.0</td>
<td>NA</td>
<td>14.9</td>
<td>NA</td>
<td>NA</td>
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<tr>
<td></td>
<td>Urban</td>
<td>16.6</td>
<td>5.8</td>
<td>6.3</td>
<td>4.7</td>
<td>6.7</td>
<td>6.8</td>
<td>13.8</td>
<td>5.4</td>
<td>5.2</td>
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</tr>
<tr>
<td></td>
<td>Rural</td>
<td>16.6</td>
<td>0.7</td>
<td>3.5</td>
<td>2.4</td>
<td>0.8</td>
<td>0.5</td>
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<td></td>
<td>Total</td>
<td>23.6</td>
<td>3.9</td>
<td>5.5</td>
<td>5.4</td>
<td>5.2</td>
<td>3.5</td>
<td>14.7</td>
<td>5.9</td>
<td>1.6</td>
<td>9.5</td>
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<tr>
<td>At work</td>
<td>Metro</td>
<td>25.0</td>
<td>20.9</td>
<td>NA</td>
<td>12.2</td>
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<td>25.4</td>
<td>5.4</td>
<td>2.7</td>
<td>3.9</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>20.9</td>
<td>10.9</td>
<td>12.0</td>
<td>9.9</td>
<td>14.5</td>
<td>7.8</td>
<td>25.0</td>
<td>8.5</td>
<td>5.5</td>
<td>15.8</td>
</tr>
<tr>
<td>Using mobile devices</td>
<td>Metro</td>
<td>64.5</td>
<td>67.0</td>
<td>NA</td>
<td>62.6</td>
<td>52.8</td>
<td>NA</td>
<td>62.2</td>
<td>NA</td>
<td>NA</td>
<td>61.6</td>
</tr>
<tr>
<td></td>
<td>Urban</td>
<td>45.1</td>
<td>55.4</td>
<td>57.2</td>
<td>50.0</td>
<td>57.6</td>
<td>59.9</td>
<td>73.1</td>
<td>63.3</td>
<td>55.7</td>
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<tr>
<td></td>
<td>Rural</td>
<td>25.8</td>
<td>29.0</td>
<td>39.4</td>
<td>41.0</td>
<td>35.5</td>
<td>45.2</td>
<td>58.8</td>
<td>50.0</td>
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<tr>
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<td>Total</td>
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<td>48.0</td>
<td>52.2</td>
<td>52.4</td>
<td>47.1</td>
<td>52.4</td>
<td>63.6</td>
<td>55.8</td>
<td>40.0</td>
<td>53.9</td>
</tr>
<tr>
<td>At Internet Cafes or educational facilities</td>
<td>Metro</td>
<td>12.6</td>
<td>10.8</td>
<td>NA</td>
<td>6.8</td>
<td>15.9</td>
<td>NA</td>
<td>16.8</td>
<td>NA</td>
<td>NA</td>
<td>15.1</td>
</tr>
<tr>
<td></td>
<td>Urban</td>
<td>11.3</td>
<td>9.0</td>
<td>3.5</td>
<td>8.5</td>
<td>8.9</td>
<td>5.4</td>
<td>14.7</td>
<td>5.9</td>
<td>3.7</td>
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<tr>
<td></td>
<td>Rural</td>
<td>1.1</td>
<td>1.3</td>
<td>4.3</td>
<td>6.0</td>
<td>4.8</td>
<td>3.0</td>
<td>9.3</td>
<td>4.2</td>
<td>1.9</td>
<td>3.2</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>11.6</td>
<td>6.2</td>
<td>3.7</td>
<td>7.7</td>
<td>9.9</td>
<td>4.2</td>
<td>16.4</td>
<td>4.9</td>
<td>2.3</td>
<td>9.8</td>
</tr>
</tbody>
</table>

Source: ICASA (2018)

Certain government services in South Africa have been made available online. These include filing taxes, car registration, driver’s license renewal and the online purchasing of credits for electricity and water in some cities. Not all the services have been successfully implemented, but in 2011, it was noted that 99% of submitted tax returns, were made online, indicating a demand for functional e-government services (McKinsey&Company, 2014). However, at the same time, Research ICT Africa, reports that the policy environment is not conducive to investment or competition within the communications sector.

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1 It is important to note that the access statistics reported by ICASA differ from those reported in the General Household Survey, produced by Statistics South Africa
Bottlenecks in regulation and policy making constrains the growth of the communications sector. In addition, the telecommunications sector is seeing a transition from voice services to data services, impacting the business model of the sector (Gillwald, Moyo, & Stork, 2012).

Some of the other challenges reported by Research ICT Africa pertaining to the adoption of ICT in South Africa include poor institutional arrangements supporting regulators such as ICASA and USAASA; limited rollout of undersea cables and the limited capacity/strength of the national backbone for bandwidth; leased line rental for bandwidth remains due to no competition; high mobile and fixed line retail prices and spectrum allocation bottlenecks; and the weak financial performance of Telkom (Gillwald et al., 2012).

Given, these challenges one finds that South Africa is a net importer of ICT goods and services, with the size of the net importation of these goods/services increasing by 100% between 2014 to 2017 (Department of Telecommunications and Postal Services, 2017). Consequently, the opportunities to lead in terms of new innovations across sectors is limited, if services and products are consumed from international sources. Recognising that local competition is weak, and barriers to market entry are high, innovative entrepreneurs find it difficult to break into the ICT sector. Following this line of thought, PwC notes the rapidly changing space in the manufacturing sector but notes that real gains are only experienced by a select few due to the limited competition. PwC has found this trend occurs internationally and locally within in South Africa. PwC describes those leading digital transformation of the sector as ‘Digital Champions’ who can innovate and apply new solutions, with the market’s choices becoming more limited in terms of which products/services they consume. PwC believes for South African businesses to succeed, their business models must connect the strategic, operational, technological and people related capabilities to which they have access (Camarate, 2018). In addition to such an internal approach for businesses, it is also vital at the macro level to promote greater innovations, that competition law must be revised and the barriers to entry should be lowered.

To digitally transform the South African economy, the Centre for Competition Regulation and Economic Development believes that transformation in the country will follow an evolutionary model and not a revolutionary one. This follows from the aforementioned reasons such as the dependence on product and service that the country experiences in general and not only in the ICT sector. The Centre further believes that policy makers must analyse the economy carefully and identify root industries which will drive economic growth. This includes the production of materials such as plastics and metal casings which are used in other sectors (Mondiliwa, 2018). Nimrod Zalk from the Department of Trade and Industry also advises that an emphasis on manufacturing and industrialisation is necessary for the stronger growth of
the economy in the long term. In the post-Apartheid era, South Africa has undergone a period of de-industrialisation, led by the reliance on product/service imports, but to promote growth, a diversified and re-industrialised manufacturing sector is essential (Ngulube, 2014).

Experts in this area believe technological advancement and transformation will come from greater investment in cross-sector knowledge sharing activities, the development of technical and entrepreneurial skill, a revitalised regulatory system and innovative systems which support elements of design, data analysis and the broader incorporation of Science, Technology, Engineering and Mathematics (STEM) across sectors (Mondiliwa, 2018).

The study participants also argued that the emphasis of investment in the STEM field of research should also be targeted towards foundation and primary school education of science and mathematics. At the lower levels, these are the subjects with the poorest performance and interventions are required whilst learners are still in school and not only targeted towards those who are completing tertiary studies in this field. It is believed that the Science and Technology Ten Year Plan is exclusionary in the manner in which science graduates are promoted and receive benefits. Such graduates have already built their capabilities above that of the unskilled and poor. The current programme is further promoting inequality.

For each initiative that is supported, the central question that must be asked, is who benefits from the initiative. If the local economy and entrepreneurs are able to receive the primary benefits of such investments, it is expected that innovations will flourish.
5 SCENARIO 1 – PESSIMISTIC OUTLOOK

The first and most likely scenario to persist as adamantly argued by the study participants was that of a negative outlook for the future leading to 2030. In this scenario, the participants discussed the social and technological prospects for the country and imagined which position the country could reach by 2030. Given the afore mentioned social and technological challenges due to our current policies, the participants found it difficult to imagine that the country could transition from a state of low social cohesion and low technology advancement. At best, it was suggested that some businesses could leverage some of the benefits of new technologies, without innovating locally, and therefore move close to the midpoint of low and high technology advancements.

The arguments in support of this position were the following:

The current ideological neoliberal policy framework, as adopted in South Africa, does not support socially constructive policies which could support levels of greater digital inclusion, education and skills development. The influence of businesses on the South African economy is too strong and therefore does not support a sufficient level of development necessary to progress socially or technologically. It is in the interests of businesses to maintain the current status-quo, which support the large outflow of profits from the economy, due to the emphasis on imports and an unbalanced liberalised trade framework. The distorted levels of high inequality are consequent of this policy framework.

The economy will remain to be highly concentrated, and it is expected that this concentration will worsen over time. Such oligopolistic competition does not promote innovation, but rather fosters a dependence on existing market players. There is a need for greater competition which needs to be inculcated at the policy level. Small business will struggle to compete in the market due to the high barriers of entry.

It is expected that the business sector will adapt to the levels of skills and infrastructure in the economy. Businesses are well placed to mobilise and adapt to the environments they find themselves in. The market has no incentive to change the current trajectory and attempt more creative approaches to absorb greater numbers of the workforce and respond to the problems of poverty and inequality. Subsequently, existing monopolies will continue to reap profits in an unchallenged manner. In this environment it is expected the conditions under which the poor, unskilled and unemployed find themselves will remain largely unchanged. With the shrinking of the middle class expected to follow, and greater numbers moving into
poverty, it is also expected tensions between rich and poor will grow with an expected increase in the quantity of service delivery protests.

Given this unbalanced trade framework, businesses are unable to compete with international mega-corporations whom have the opportunity to transact within the borders of the country tax-free, whilst local small-businesses do not receive such exemptions. The range of goods exported since 1994 remains largely unchanged and opportunities for expanding exports to international markets are not currently apparent. Furthermore, local production is minimised due to the country’s dependence on imports.

By emphasising services above manufacturing, the country does not develop its productive capacities. This has become more difficult for South African based firms to compete in international markets due to the high barriers to entry in most sectors. Thus, the challenge for local small businesses also applies to the large corporates attempting to enter foreign markets. The additional challenge that the country must be wary of is that of buying into the international leapfrogging narrative which argues for the promotion of digital services, at the expense of physical infrastructure investments. Physical infrastructure remains necessary to ensure a suitable foundation is laid to promote the future industrial capabilities of the country in a more inclusive manner.

Further, the impact of digital disruption on work opportunities only accelerates the existing trajectory of forces impacting the labour market. If businesses follow an evolutionary business model within the current low competition, low innovation economy, it was expected that greater products/services would be outsourced to companies beyond the country’s borders, which, for example, would continue the decline of factory-based workers. The influence of digital disruption simply brings quickens the pace of this transformation.

The South African Government’s approach to policy making will remain fragmented and convoluted, inhibiting the effectiveness of policy proclamations. A coordinated policy making framework is needed to ensure that all role players recognise the importance of this initiative and the need to efficiently use resources to deliver policy change. Furthermore, progressive policies are irrelevant if they are not supported by an enabled regulatory environment and effective implementation programme.
6 SCENARIO 2 – OPTIMISTIC OUTLOOK

Despite an unlikely prediction, the study participants examined a potential scenario, where the current policy framework in the country was radically transformed in a manner which promoted inclusive growth supporting strong social cohesion and the strong adoption of new innovative technologies. This scenario in many ways can be considered a mirror image of Scenario 1, whereby the policy approach is reversed, the emphasis on imports is replaced with an emphasis on exports, worker rights are promoted, competition is high and enabling innovative practices to take a strong foothold.

To reach such a state, the following initiatives are required:

To support a more inclusive growth trajectory, the country needs to firstly abandon a purely neoliberal policy making approach. This requires the country to take a brave stance in opposition to the international capitalist norm. Manuel and Luna (2007) outline 3 alternatives to the pure neoliberal framework such as pure Keynesianism, real Socialism or a 21st Century approach to Socialism. Progressive alternatives are required which clearly identify the economic and human development goals that a country wishes to inculcate. Pure Keynesianism still promotes the pursuit of profit, but not through the exploitation of labour and a reliance on neoliberal austerity programmes. Such a capitalist model which supports worker protections is favourable to the current approach which reinforces inequality and denies poor basic human dignities. There is also a need to funnel the existing wealth of the country to the sectors in the greatest need and also the sectors with the greatest potential to have the widest benefit to the country, in the long run (towards 2030). Thus, there is a need for more distributive policies.

Under such an ideological shift, structural transformation can become a reality. This would involve addressing structural weaknesses pertaining to competition, industrialisation, the means of production, employment creation, social protections, community engagement, high inequality and unsustainable levels of poverty. Bell, Goga, Mondliwa and Roberts (2017) argue that meaningful participation must begin with investments in capabilities. Greater capabilities will lead to a more skilled and productive labour force, who are enabled to compete in local and international markets. Such investments into capabilities must be incentivised by government to ensure businesses adopt such programmes.

The promotion of manufacturing is central to due to its interdependencies across sectors such as the motor industry, agriculture and mining, amongst others. By developing the means of production, the country has a better opportunity to take advantage of technology driven growth. The industries which can
be leveraged based on current comparative advantages are within the Metals, Machinery and Equipment, Automotive Vehicles and Components and Agriculture and Agro-processing sub-sectors. South Africa possesses indigenous forms of knowledge unique to the country and environment which can be taken advantage of. Partnerships and business models which support such partnerships between organisations with expert levels of knowledge will help build a broad coalition for reindustrialisation. Further, collaboration between government, business and labour will help drive industrial development.

**Altruistic technology implementations** can make a tangible impact on social cohesion, if such products/services are delivered with an intention to solve a particular social challenge and not solely to produce profits. Various examples exist where innovative technology uses can impact communities and promote levels of human development. For example, services such as mobile banking, mobile health care, agriculture data centres coupled with call centres to farmers expert advice and e-education programmes have been implemented with strong results internationally (Davis, 2013). Various other examples exist highlighting how technology can be socially beneficial and innovative usage of such services can complement the existing traditional programmes and support an unserved and underserved portion of society when it comes to service delivery. Innovative technology uses will also take into consideration options to incorporate technologies which reside within Maslow’s ‘Self Actualisation’ level (discussed earlier), however, in adopting such technologies, sufficient investment is required to ensure that the foundational levels of technology are in place, affording innovators the space and opportunity to leverage new technologies.

**Regional development and integration** will help drive growth in the SADC and Sub-Saharan Africa region and across the African continent. With greater development of our neighbouring countries, new opportunities for growth would emerge. Again, in this instance, leveraging indigenous knowledge will be beneficial when building such relationships.

**Competition law reforms** are adopted which lower the barriers to entry for small businesses. Furthermore, such reforms enable a level playing field allowing local business owners to compete against international corporates who pay relevant import trade tariffs where necessary, which benefit the country. Local trade protectionist policies are needed where for example, currently Amazon does not pay VAT on trade conducted locally as opposed to a South African retailer who must pay tax on business conducted within the country. Thus, a SA competitor finds it much harder to compete against such megalithic corporations.
With increased healthy competition amongst businesses, **innovations** will provide the value add that businesses require for success. Innovation is also fostered through **skills development programmes** which are instituted based on the technological demands of businesses. Such programmes must be responsive to the needs of the labour market, which also requires a re-examination of how a skills development programme is formed and how students receive necessary certification for undergoing such training. When developing the innovation programme, it is important that entrepreneurs are supported in the manner they receive funding whilst also benefiting from a safety net which allows innovators the opportunity to fail and attempt a new idea.

With the advent of looser employer/employee relations, following from the emergence of the platform economy, there is a need for **stronger labour protections**. Labour is too closely coupled with government in the current power dynamic. This is at the expense of the labour force. Labour must remain resistant to neoliberal policies and should oppose such initiatives more strongly.

**Inclusive platform economies** promoting partnerships between experts and people in need will assist in driving growth, talent development and productivity. However, such platforms should be developed in such a manner to ensure that the service can manage such partnerships in a sustainable manner. For example, a jobs recruitment platform could be constructed which engages employers, employees, trainers and funders. Such a platform could promote the development of workers capabilities whilst developing a sustainable revenue sharing model allowing all stakeholders to be sufficiently compensated for their contributions. Such a model transforms existing placement platforms which concentrate on providing low skilled workers access to low productive jobs without including opportunities for such workers to develop their capabilities, with the aim of accessing more productive jobs in future.
7 POLICY DRIVERS AND KEY FACTORS

During discussions with the study participants, the following drivers and key factors were identified which would influence change, by affecting social cohesion and technological advancement.

7.1 POLICY COHERENCE

A coherent and coordinated policy approach across the multiple arms of government is essential for social and technological development. In addition to replacing the existing neoliberal policy framework, it is important that each department and agency of government clearly understands their mandate. Given that technological advancement impacts all sectors of the economy, it is still necessary to ensure that government departments/agencies are able to coordinate their activities in an efficient manner, particularly when such initiatives fall into a common space shared by multiple stakeholders. For example, skills development is widely recognised as a driver of change, with multiple departments instituting training programmes. In such areas, shared programmes are needed to ensure duplication and regulatory interference is minimised.

When constructing policies, it is important to form a holistic approach which considers policy from the top-down and also bottom up perspectives. From the top-down, policies are crafted from the perspective of the central government, which adopts a broad inclusive framework, whilst the bottom-up perspective, is crafted from the community level, ensuring there is broad consultation and engagements, recognising how community factors differ at the local level. Thus, a policy implementation framework must consider the local environment and be refined to account for factors pertinent to a particular community. Consultation is also required to ensure that knowledge is shared amongst all stakeholders. Cross-sectoral engagements are beneficial as they promote knowledge sharing.

As discussed in the previous section, policies should concentrate on the following concerns:

- Reducing the barriers to entry for new business entrants and promoting competition
- Promoting innovation
- Promoting regional integration
- Promoting industrial development with a focus on manufacturing
7.2 **ACCESS AND AFFORDABILITY OF DIGITAL INFRASTRUCTURE**

The National Integrated ICT White Paper of 2016 refers to the country’s National Development Plan which states that the country envisions a connected information society and a vibrant and inclusive knowledge economy. Infrastructure is essential backbone required to reach this goal, and access to this infrastructure will help drive further digital inclusion. However, as noted in the ICT White Paper, networks, services, devices, applications and content must be accessible to all sectors of the population (Department of Telecommunications and Postal Services, 2016). This policy requires an interconnected approach in developing the physical network infrastructure backbone of the country in the form of underground and undersea cabling and through the management and allocation of the spectrum in support of mobile networks. Further the services that are offered, must be cognisant of the capacity of the network as well as the devices that all people have access to. In particular, government services made online, need to be delivered in an inclusive manner understanding the functionality of the such devices. Furthermore, the applications offered must be designed in a manner which is compatible with the limitation of the device’s interface. In South African society, where more than half of the population uses 2G phones which support the USSD interface, more services should be tailored inline with this level of sophistication. In addition, the content created must also be compatible with the devices that people access.

In line with these considerations, access is also closely associated with issues of affordability, pricing, the type of device and the relevance of the content. At the international level, the challenges of limited internet access in South Africa is shared by a number of our G20 partners. For example, South Africa, China, India and Indonesia all experience low internet access. South Africa, India and China have approached 50% internet access as at 2015, with steady growth over the previous 5 years (Internet World Stats, 2017). Furthermore, approximately a third of the World’s disconnected population reside within the G20, reflecting the burden these country’s carry in addressing issues of the digital divide.
Internet access at the household level is also a challenge. As at 2015, as reported within the General Household Survey, it was found that 65% of households did not have access to the internet. When these respondents were questioned why they did not access the internet, the following reasons accounted for 89% of the disconnected respondents, who noted they (a) did not possess the necessary knowledge (36%), (b) had no interest in the internet (33%), (c) the cost of equipment was too high (20%) and the cost of subscriptions were too high (3%). Clearly, the issues of cost, knowledge and relevant content are central to promoting more inclusive digital access.

If digital access remains unaffordable, there will become a proliferation of 2 economies in the country – a shrinking formal economy and expanding informal economy, disconnected from the rest of the digitally connected world. The high costs of access to the internet and technologies impede the poor’s ability to benefits from such technologies, effectively dividing them from the productive sectors of society. In contrast, greater access to technology during the formative years will help learners and society in general become more familiar and comfortable in the use of technologies. Technophobia has been identified as a factor affecting poor communities with limited access to technology, which limits their productivity when using such tools later in life (Ha, Page, & Thorsteinsson, 2011). Greater technology access, therefore, could in turn lead to more innovative uses of technology leading to more competitive industries located in the country. There is a need to promote greater internet access, made more available to the youth in school and other public places such as community centres. Coupling such services to transport networks will help improve general accessibility, allowing greater numbers to find better opportunities derived from technology access.
When one reviews mobile phone usage trends, one finds that the majority of the population (55%) in South Africa actually use 2G phones, with limited functionality, as compared to with 34% who possess the more advanced smart phones. This is in contrast to the trends experienced in the USA in 2015. If greater
services are targeted to 2G phones in the interim between now and 2030, there is an opportunity to target services directly to the majority of the population. Fintech services which concentrate on this medium have found great success in Eastern Africa. Such benefits include (1) greater financial inclusion, (2) access to banking products such as remittances and microfinancing and (3) opportunities for online trading. Services using this medium which focus on improved connectivity between parties such as educators and learners, for example, can lead to gains in the education sector. Whilst technology and service provision tend to focus on the more advanced tools such as new iterations of smart phones, there is currently an unserved portion of the population who would directly benefit from innovative low-tech services. The transfer of data and information is a key contributing factor to driving productivity. Cheaper products and services promote the accessibility of such tools and will contribute to the alleviation of poverty and lessening of inequalities. This is an area which also requires further exploration.

*Table 3 – Cellular phone access in a selection of African countries (2015)*

<table>
<thead>
<tr>
<th></th>
<th>Smart phone</th>
<th>2G Phone</th>
<th>No Cell Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>64</td>
<td>25</td>
<td>11</td>
</tr>
<tr>
<td>South Africa</td>
<td>34</td>
<td>55</td>
<td>10</td>
</tr>
<tr>
<td>Kenya</td>
<td>15</td>
<td>67</td>
<td>18</td>
</tr>
<tr>
<td>Tanzania</td>
<td>8</td>
<td>65</td>
<td>27</td>
</tr>
<tr>
<td>Uganda</td>
<td>5</td>
<td>65</td>
<td>34</td>
</tr>
</tbody>
</table>

*Source: Pew Research Center (Poushter, 2016)*

In addition, the cost of broadband data access in South Africa is skewed against the poorer portions of the population as described in the figure below. It was found that when broadband access is purchased in smaller data bundles, it is substantially more expensive in South Africa compared to other African countries. It appears that the poor are the ones who bear the burden of high data costs, as those who can purchase larger data bundles were able to access the service at more affordable rates.

For those purchasing a 1GB of data in smaller data bundles, they were found to spend close to 120USD whilst, those purchasing 1 GB of data via larger data bundles spent less than 20USD, highlighting the vast disparity in data bundle costs. This contrasts with Kenya, for example, where the difference in data bundles cost is not as significant considering that either option cost less than 20USD (Schumann & Kende, 2013). Research ICT Africa has also found that the cost of broadband remains a serious challenge within the country. Exponential growth is needed for South Africa to reach levels of access and speed experienced within the developed world (Gillwald et al., 2012).
Managing digital skills development has been identified as a clear lever to manage the diffusion of digital skills amongst the population. Such training must be targeted to the needs of the population and be revised in a responsive manner, reacting to the changes in the labour market. There is a need to ensure the supply of digital skills are suitably aligned to the demands of employers. Education programmes must be designed in a manner that provides suitable recognition for skills and experience attained. In addition, often experience is an ignored driver of accessing employment, with many graduates struggling to secure employment due to their lack of formal experience in a business setting. The idea of nanodegrees was touted by some respondents as a novel means to adapt the curricula of tertiary education to the needs of employers. The nanodegree would not replace established university programmes but complement the existing offerings to students. Such options should be further explored.

Reversing the current trends in the education sector in South Africa, is vital to address unemployment and improve the quality of life of future generations. Without addressing the supply of skills, businesses are...
likely to become less innovative, less competitive and ultimately less productive. Not addressing these challenges will condemn the next generation to a repeat the inter-generational cycle of poverty.

As described in the table below, the following multidisciplinary skills must be promoted to allow a new entrant to the labour market the opportunity to get access to an entry level position. By being able to apply skills pertaining to information, computer, media, communication and technology disciplines, to specific business problems, it is expected that learners will be able to provide greater value to employers, making them more attractive for hiring (Chetty, Aneja, Mishra, Gcora, & Josie, 2018).

Table 4 – Digital Skills framework – progressing from Literate to Fluent and Master

<table>
<thead>
<tr>
<th>Skill Set</th>
<th>Literate</th>
<th>Fluent</th>
<th>Master</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information</td>
<td>Finding, evaluating, organising, using content;</td>
<td>Understanding the need for information; identifying what type of information is needed</td>
<td>Synthesising, creating information</td>
</tr>
<tr>
<td>Computer</td>
<td>Competence in using hardware and software tools; understanding access controls; Ability to publish and communicate using available tools; Using spreadsheets and word-processors</td>
<td>Using IT tools for research and scholarship, Ability to evaluate the benefits of new technologies</td>
<td></td>
</tr>
<tr>
<td>Media</td>
<td>Access, navigating and editing text, sound, image and video media; Communicate via media platforms</td>
<td>Understanding graphic design principles, the combination of visuals and text, the use of sound; The nature of web authorship;</td>
<td>Critical analysis and evaluation of mass media; Production of multi-media content;</td>
</tr>
<tr>
<td>Skill Set</td>
<td>Literate</td>
<td>Fluent</td>
<td>Master</td>
</tr>
<tr>
<td>-----------</td>
<td>----------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td><strong>Communication</strong></td>
<td>Using and constructing hyperlinks between documents and/or images, sounds, movies, semiotic languages used in email, online chat space or in instant messaging</td>
<td>Producing ‘non-linear’ texts, navigating three-dimensional worlds online and so on</td>
<td>Ability to critically analyse and evaluate ‘non-linear’ texts and three-dimensional worlds online</td>
</tr>
<tr>
<td><strong>Technology</strong></td>
<td>Ability to use technology within life situations</td>
<td>Communicating and negotiating meaningful content through the medium of encoded texts within contexts of participation</td>
<td>Ability to adopt, adapt, invent, and evaluate technology to positively affect his or her life, community, and environment</td>
</tr>
</tbody>
</table>

**Source:** Chetty, Aneja, Mishra, Gcora, & Josie (2018)

In addition to progressing from a literate level to a level of mastery, one’s training in these skills must also capture three key perspectives, viz., the cognitive, technical and ethical perspectives. The cognitive perspective relates to the manner in which you synthesise, evaluate and create using the skills you possess. The technical perspective relates to how one accesses, uses, navigates and develops new content whilst the ethical perspective pertains to what constitutes the appropriate usage of such a skill (Chetty, Qigui, Gcora, Josie, & Li, 2018).

*Table 5 – Digital skills framework – incorporating the cognitive, technical and ethical perspectives*

<table>
<thead>
<tr>
<th>Cognitive</th>
<th>Technical</th>
<th>Ethical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information</td>
<td>Synthesis</td>
<td>Access, Usage</td>
</tr>
</tbody>
</table>

(Digital Content)
<table>
<thead>
<tr>
<th><strong>Cognitive</strong></th>
<th><strong>Technical</strong></th>
<th><strong>Ethical</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Computer</strong></td>
<td>Evaluate</td>
<td>Usage</td>
</tr>
<tr>
<td><strong>(Hardware and software)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Media</strong></td>
<td>Critique, Create</td>
<td>Navigation</td>
</tr>
<tr>
<td><strong>(Text, sound, image, video, social)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Communication</strong></td>
<td>Critique, Create</td>
<td>Develop and use content</td>
</tr>
<tr>
<td><strong>(non-linear interaction)</strong></td>
<td></td>
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<tr>
<td><strong>Technology</strong></td>
<td>Invent, evaluate tools</td>
<td>Usage</td>
</tr>
<tr>
<td><strong>(Tools for life situations)</strong></td>
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*Source: Chetty, Qigui, Gcora, Josie, & Li (2018)*

In developing digital skills training programmes, it is important to recognise the fluid nature of digital skills. Skills deemed relevant to businesses this year, can possibly be replaced in the next year. Therefore, it is important that the skills development framework can be reconfigured and adapted in an agile manner. This requires ensuring that digital training stakeholders work together to ensure that the demands of labour market are met by the supply of skills from training institutions (Chetty, Aneja, et al., 2018). Training is required not only for those within the school system, but also those that are currently working or had left school early. Retraining is necessary, due to the rapid advancements of technology.
7.4 THE INFLUENCE OF SOCIO-CULTURAL NORMS

Socio-cultural factors cannot be excluded when developing a digital policy implementation programme. These factors influence how people engage in training programmes and respond to community engagement initiatives. For example, the digital gender divide is reflected across statistics of women’s access to digital technologies, training programmes and various services. It is necessary that policy makers are aware of the entrenched social attitudes which are pervasive at a community level, and implement programmes which account for such challenges (Chetty, Aneja, et al., 2018).

For example, if a training facility is frequented largely by males, it is possible that the community attaches negative connotations of promiscuity to women who visit such facilities, not recognising the value that the training programme offers in building one’s skills. In India, where such scenarios are prevalent, the approach has been to hold training programmes which are managed and delivered by women at times appropriate for a woman to attend given their challenges of ‘time poverty’. To ensure that such programmes are successful, they must be tailored in line with the actual challenges experienced by woman in such areas (Asian Development Bank, 2015).
Furthermore, various services afforded to men may not reach women. For example, formal bank account access in the SADC region reflects that males have a larger number of such accounts, whilst females access informal bank accounts to a greater extent than men. The underlying reasons for such trends needs to be examined to understand, what factors stand in the way of woman accessing services where they are available (Fanta & Mutsonziwa, 2016).

Figure 15 – Formal bank account ownership (left) vs informal account ownership (right) by gender

Data is often described as the ‘new oil’ which drives the digital economy. The ability to extract, store and analyse data in a manner supporting new and useful insights, drives new business opportunities and economic growth. Further, the manner in which an organisation is able to leverage these insights can determine how successful and relevant their business continues to be. The increasingly complex technology eco-system within which businesses must operate further complicate the manner in which useful insights can be produced. This complexity can also be seen as an opportunity for small businesses to compete against large corporates and produce new knowledge and innovative products/services which are best placed to succeed in the new digital economy. If one considers the world’s largest platforms such as Google, Amazon, Facebook, Uber, Whatsapp, WeChat and Alibaba, the common denominator across these platforms is their ability to process data and turn it into useful products and services.

Processing data and statistical trends has always influenced the manner in which an entire sector operates, for example, agriculture advances are driven by data trends. Data driven innovation in essence improves business and government efficiency and further has a transformative social quality depending on how the data is applied (Andrade, Hemerly, Recalde, & Ryan, 2014). Despite the wealth of data which is produced on a daily basis through connected devices or big data sources, it is also equally important to
understand the existing data gaps which prevent us producing relevant insights for those that are not currently connected. Big data extracted from social networks, for example is produced from those with internet access and predominantly use a smartphone to do so. Those without access to the internet or a smartphone are generally excluded. Thus, the trends produced via such sources are biased towards those with greater financial means to connect to such services. Ultimately, the trends extracted from big data sources do not portray the concerns or needs of the disconnected population. In going forward, finding the means to gather data in real-time of those currently offline, will help expose the underlying trends of the disconnected, and will help produce content more relevant to their requirements. This would help the current disconnected overcome beliefs that the internet and the digital services have no relevance for them.

To leverage these trends, there is a need to promote data intensive occupations across all sectors. Data scientists possess the rare ability to make sense of this vast array of information, and notably the profession was described as the sexiest job of the 21st Century by the Harvard Business Review (Davenport & Patil, 2012). The shortage of data scientists, whom are able to merge computer science and statistical training in a single field, has been found to be a constraint in many sectors within the United States as well as locally.

7.6 LEAPFROGGING – BALANCING INFRASTRUCTURE DEVELOPMENT AGAINST E-SERVICES

When we consider leapfrogging implications, we must ensure we do not conflate manufacturing with services. It is important that we don’t bypass manufacturing in the belief that e-services will provide a strong basis for development. If we learn from the Indian and Chinese economic model, India promoted services for the last 2 decades whilst China emphasised manufacturing. By promoting manufacturing, the country has built a strong foundation to absorb large portions of the population who were low skilled and poor. This moved a high portion of the country out of poverty. India, in contrast, promoted services, and has a weak industrial foundation which has not absorbed much of the workforce, ensuring that much of the population did not benefit from the investment into the services sector. Viswanathan (2017) explains the challenges that manufacturers experience in India, and many of them follow from an unstable infrastructure backbone in the country, which is not the norm in China. For example, power availability, transport network and access to skill labour are not reliable within the country.
The study participants firmly believe that promoting services at the expense of manufacturing leaves the population in state of precariousness. Furthermore, the country does not have the appropriate level of digital skills to adequately benefit or contribute to the services sector. Accordingly, one must consider the idea of leapfrogging very carefully when constructing policy. There are benefits to the rollout of digital services, but one must recognise the weaknesses of certain digital services which cannot replace physical infrastructure. Thus, the leapfrogging benefits must be critiqued in light of the expected benefits. Such initiatives should run in parallel to longer term infrastructure development initiatives. Planning strategically is difficult but necessary.

7.7 **Greater Labour Protections**

Within South Africa, there is a need for stronger labour protections. Currently, the labour unions are too closely coupled with government through the tripartite alliance of the African National Congress (ANC), the Communist Party and the Congress of South African Trade Unions (COSATU). Theoretically, one assumes that the Communist Party and COSATU would provide the necessary checks to ANC led policy making in the country. In practice, the opposite is found to be true, whereby from an outside perspective, the unions have had little influence to counter the neoliberal policy direction of the country. Going forward it is necessary that labour unions play a stronger role and remain resistance to policies which impede the developmental agenda of the country.

A consequence of digitalisation and the Gig-Economy is the greater precarity of work. It is expected that salaries will become more infrequent and less dependable. There is a need for stronger worker protections to stabilise the receipt of salaries. Income will become less dependable resulting in more people becoming more precariously positioned. Furthermore, it is also expected that workers will be under pressure to assume greater risks such as the insurance of the assets used to fulfil the core function of the business. In such scenarios, stronger labour protections are required, to ensure that production and profits are not promoted at the expense of worker rights. These social challenges may not be unique to the digital economy, but as the pace of change is rapid, these inherent weaknesses and loopholes in public policies are exposed at a faster rate.

7.8 **Opportunities for Financial Technologies**

Greater financial inclusion has been widely recognized as a means to assist individuals cope with poverty, manage expenditure and to start small business enterprises. At the macro level, it assists to boost
economic growth through mobilizing greater levels of savings. In addition, greater numbers are drawn into the formal economy which assists the country in raising tax revenue (Jha, Amerasinghe, & Calverley, 2014). The World Bank supports these points and highlights the importance of Financial Inclusion for policy makers world-wide considering its potential impact on poverty and prosperity (World Bank Group, 2014).

Given the benefits for the poor, traditional banking facilities present numerous obstacles for indigent populations, limiting their ability to be formally banked. Various studies highlight these factors as financial literacy, high transaction fees (particularly with low value transactions), a lack of formal financial products suited for the needs of low income earners, distances to banks and the high cost of transport and national policies which inhibit financial inclusion (Plan UK, Barclays, & Care International UK, 2011). The banking sector has grappled with these challenges and have developed various complex strategies to bridge the gap between financial exclusion and inclusion. Many of these traditional programmes have been ineffective, however recent advances in Fintech offer novel opportunities to bridge this gap and provide practical solutions to combat poverty.
8 CONCLUSION

Digitalisation is accelerating the pace of change. Unresolved challenges within policy are revealed much faster, exposing the weaknesses of government processes in the manner it is able to respond to such requirements. Although the study’s respondents hold a pessimistic outlook for South Africa’s future position, opportunities do exist to allow the country to compete internationally with the developed world. To reach the state of high social cohesion and high technology advancement, the drivers of change referred to in this paper must be explored in a much deeper manner. The paper seeks to provide an overview of the key issues that policy makers must consider when constructing a pathway for the country to deliver on the goals that the New Development Plan has set for 2030. In summary these priorities are:

- Promote industrial development
- Ensure manufacturing in key sectors is promoted.
- Promote higher competition and innovation within the economy
- Support regional development and integration
- Ensure a coordinated policy making environment exists
- Promote digital access and affordability
- Promote a well aligned supply of digital skills in line with the needs of employers
- Promote data scientists and the manner in which data is leveraged by local businesses
- Ensure labour protections are in place.
- Explore opportunities for FinTech
9 References


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