SOUTH AFRICA in the DIGITAL AGE

Digital readiness assessment

FOR SOUTH AFRICA TO TAKE UP ECONOMIC OPPORTUNITIES IN THE DIGITAL AGE

DISCUSSION DRAFT FOR BETA TESTING

A report by Genesis Analytics in partnership with the Gordon Institute of Business Science and the Pathways for Prosperity Commission on Technology and Inclusive Development

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Introduction

South Africa cannot lose any more time in preparing for the extraordinary opportunities and risks presented by the digital age. While digital and other technological innovation brings significant risk, particularly in displacing labour in traditional sources of employment, it also offers new opportunities for creating work at scale in a digital economy.

Whether and how these new opportunities play out in South Africa will increasingly determine the country's collective prosperity as a nation. As traditional work opportunities start to taper off, South Africa's ability to create new forms of work in a digital economy will determine the country's future economic trajectory. In addition to creating new forms of work, having these work opportunities open to as many South Africans as possible will be critical to this trajectory creating inclusive outcomes.

Developing South Africa's readiness to seize these opportunities when they arise is therefore a cornerstone of the country's economic strategy. Identifying what South Africa should be ready for to create these opportunities is not straightforward, especially as the pace of disruptive innovation increases. But since decisions made now will determine South Africa's economic future, it is important to identify the right combination of conditions which enable these opportunities, whatever they may be, to scale significantly.

This report diagnoses the state of these enabling conditions in South Africa to contribute a baseline of knowledge for government and private sector growth initiatives. It measures where South Africa is ready for these future economic opportunities, and where gaps remain which need to be closed. Public initiatives such as the PPGI and the 4IR Commission are a means to coordinate the efforts of the public and private sector and inform national strategy. The SADA initiative and this report contributes to these processes.

This report approaches the assessment of these enabling conditions through an opportunity focused lens. While most readiness assessments provide measures of readiness from the perspective of macro-systems or enablers in the digital economy, this report takes an opportunities first approach – readiness is measured from the bottom-up for conditions that are directly relevant to unlocking inclusive growth opportunities.

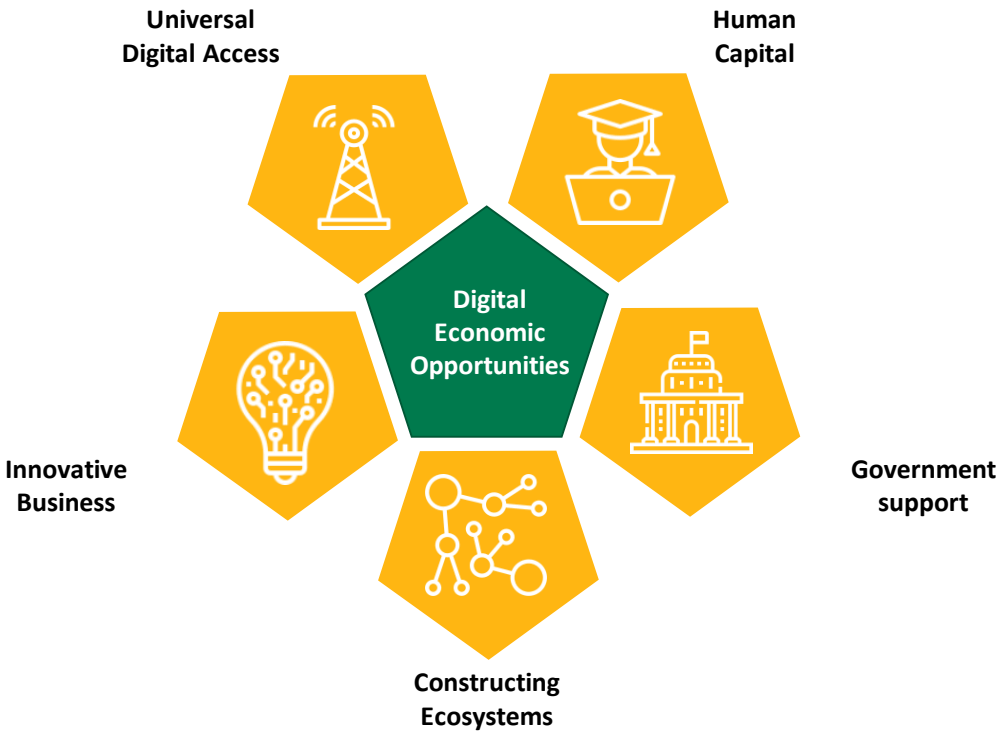
It does this by first identifying concrete economic opportunities that South Africa has the potential to take up in the next ten years. Part A of the report identifies some of the tangible economic opportunities that South Africa might realistically take up. While these may not be the exact opportunities posed to South Africa over the next decade, identifying what these opportunities might look like, and the conditions required for these opportunities to scale, provides useful context to the general concept of digital readiness.

In doing so, the report considers which readiness conditions to measure by first identifying the factors that really matter for the opportunities to be realised and scaled. This bottom-up approach allows for the measurement of more nuanced and meaningful conditions compared to typical macro readiness assessments. In Part B of the report, the set of readiness

conditions that together create an enabling environment for taking up the economic opportunities in the digital age are identified.

Once these readiness conditions have been identified, the report then measures the state of these conditions in South Africa now, with a view on whether they are sufficiently ready to enable whatever new economic opportunities are presented to South Africa. The appendix of the report provides the complete future-oriented assessment of the state of the readiness conditions to identify where there is readiness, and where gaps remain. A summary of this measurement is provided in the body of this report.

The report identifies three opportunity zones and a number of enabling conditions across five readiness categories. The opportunity zones identified are sets of related opportunities, grouped together to represent areas where any number of future economic opportunities are likely to arise. The enabling conditions for these opportunity zones are identified and measured across five readiness categories, as shown in the diagram below.



Lastly, the role these readiness categories play in driving inclusivity of opportunities is assessed. Inclusiveness of economic opportunity is defined along two dimensions. Firstly, inclusive opportunities have fewer barriers to access for individuals. These barriers may relate to finance, geography, demographics, educational attainment or others. Secondly, the benefits primarily accrue to those that access them and are not concentrated in a single group such as asset owners or business owners. Each readiness category is assessed in terms of its importance for inclusivity, and current gaps in supporting inclusivity are noted.

PART A: OPPORTUNITY ASSESSMENT

This opportunity assessment aims to provide an indication of the types of economic opportunities that South Africa may feasibly realise and scale over the next ten years. In order to do that, it is important to define up front what constitutes an opportunity. Technology innovation has application to so many economic outcomes – GDP growth, exports and the balance of trade, market efficiency and competitiveness, and many others – so it is important to be specific. This report defines digital economic opportunities as the application of technology and other kinds of innovation in markets where significant income-generating work is created, and where better access to these income-generating opportunities is enabled. A high-level feasibility proviso was included so that unrealistic opportunities that South Africa could not access were not considered.

To identify these opportunities, three bottom-up methodologies were used. The methodologies are bottom up because they look for specific examples of economic opportunities rather than thinking about how technology can be applied to broad sectors or industries. The *fast follower* approach looked at what work-creating innovation is occurring in other parts of the world, and whether South Africa could replicate this. The *fixing what is broken* approach identified systems, processes or markets that are not functioning in South Africa, and assessed whether technology could fix them to unlock latent demand for work. The *global opportunities* approach considered the sources of increasing demand for globally-traded goods and services, and whether South African entities could capture this demand.

The identified opportunities were grouped into three opportunity zones to describe broad areas where opportunities are likely to arise. The opportunity zones describe a broad variety of income-generating opportunities across a number of sectors, skill levels, and educational requirements. The three opportunity zones and the methodology that led to their identification are described in brief on the next page**.** The opportunity zones are then elaborated on in the following sections. Opportunities that were identified but not explicitly contained in the zones are detailed in the appendix.

Developments in ICT are allowing new kinds of work to be conducted anywhere in the world. This is opening-up services that have traditionally been proximity-based but are starting to be provided using digital technologies. This is creating work opportunities in the South African business process outsourcing (BPO) sector and for individuals who work as independent freelancers. These opportunities could scale significantly if South African individuals leverage the rising appetite for freelance work among global businesses and businesses tap into new sources of global demand in sectors such as education and health-care where services are increasingly possible to be provided virtually.

Digital platforms that aggregate and match demand and supply for low-skilled labour or sell goods online with delivery services, are creating income-generating opportunities for low-skilled South Africans across a number of sectors. Platform cost reductions and efficiency gains for consumers are unlocking latent demand for low-skilled services and products. As similar platforms expand to and scale in other sectors, there is a large opportunity for the same cost and efficiency effects to unlock latent demand for a range of low-skill and blue-collar services and emerging businesses.

Frontier technologies such as the internet-of-things, drones, robotics and AI are transforming the way organisations operate, interact and create value. The rising adoption of these frontier technologies has the potential to create additional work opportunities in a number of areas. First and most importantly, the application of frontier technology will reshape how sectors like agriculture, mining and many others operate. This will unlock new forms of production, and subsequently new job opportunities. Secondly, complementary high-tech skills such as AI, data science, and software engineering are all required to develop and deploy these innovations locally. Finally, the deployment and maintenance of frontier technology solutions will drive the demand for more common tech skills such as IT sales and support, cloud computing and information security.

Capturing an increasing share of the demand for globally-traded services

The growing demand for new forms of globally-traded services can be absorbed by a scaling up of South Africa's global business services (GBS) sector. The changing nature of work and emergence of digital business models is transforming the way businesses around the world outsource. There are new types of digital tasks that can be more efficiently outsourced, and businesses are changing the way they source global business service providers.

As markets become increasingly open, global business service firms have come under pressure to not just reduce costs and enhance efficiency, but develop strategic partnerships with source firms that add more value and allow organizations to focus on their core business. In traditional GBS areas like customer support, digitization and changing customer expectations have created the need for companies to adopt omni-channel approaches to customer engagement and support. The growing demand for managing an integrated view of customer-related information is creating new job types in the mid to high skill range in fields such as big data analytics, social media, and content development - all of which are being outsourced to GBS firms around the world who have been able to pivot to this opportunity.[1]

At the same time, the rise in affordable ICT is improving workers' connectivity and reducing the importance of location in work engagements. As a result, the labour market is changing to adopt more flexible ways of working. With technology increasingly being able to perform mundane human tasks, jobs are normally short-term in nature, requiring a specific set of skill sets and competencies. This has given rise to a new form of business process outsourcing in the form of freelance individuals and businesses working flexible and fewer hours, and located anywhere in the world.[2]

South Africa has a small but growing presence in globally-traded services and is capturing a small share of this demand from English-speaking markets.[3] Many global and regional companies have expanded their demand for outsourced work to South Africa, particularly in niche areas of specialization such as banking, insurance, asset management, IT, and legal processes where South Africa is known for its high quality English-speaking human capital. Going forward, the opportunity lies in capturing an increasing share of global outsourcing in South Africa among firms that need to become more cost-effective while maintaining quality.[4]

South Africa has the potential to create a competitive advantage for companies looking for a more viable delivery location alternative to major outsourcing centres like India and the Philippines. South Africa has a prevalence of quality English speaking talent with successful outsourcing arrangements with source firms in English-speaking markets such as the UK, US,

[1] Everest Global, InvestSA & Business Process Enabling SA (2018). South Africa's BPO industry-Pivoted for the next generation delivery
[2] Deloitte (2017). The new connected worker: Clocking into the digital age
[3] Business Enabling Process SA (2018). South Africa Business Process Services Key Indicator Report
[4] *Ibid*.

and Australia.[5] Additionally, it is has a compatible time-zone with major source countries and the operational costs of contact centre delivery are also about 50-60% lower than that of source countries.[6] This potential growth in the demand for outsourced work would result in significant employment and work opportunities for South African individuals and businesses.

There are two broad areas where these opportunities could be realized. The first is a growing GBS sector where operators are flexible and agile enough to transition to new types of jobs/tasks that will be demanded by companies looking to outsource parts of their operations in the future. The second is an opportunity for South African freelancers to access global markets through platforms which aggregate demand and supply for freelance services in the gig economy.

A flexible global business services sector that can transition to new opportunities

Unlike major GBS centres like India and the Philippines, which have already specialised in basic voice-based customer service support, South Africa's GBS sector has the potential to transition to new emerging opportunities. South Africa's GBS sector has witnessed high growth over the past 4 years with an annual growth rate of 22%, which is twice the global growth rate and three times the rate of India and the Philippines.[7] That this high growth is off a small base actually provides South Africa with a strategic advantage.

A number of South African GBS firms are already providing outsourcing services for clients that require omni-channel customer support services, and the associated data analytics and customer experience design services that optimise it. In addition, there are a range of customer engagement tasks that require socio-emotional intelligence or creative problem solving, and so are somewhat resilient to the automation that threatens traditional customer service agent jobs.

As the nature of this increasing demand is likely to shift as new tech innovations are developed, South Africa's value proposition as a sector could become its flexibility to transition to new opportunities, whatever they may be in the future. The nascency of South Africa's GBS sector means it still has the opportunity to more easily transition to supply these new types of global outsourcing demand. Having GBS firms with the flexibility to understand and resource for new types of outsourcing demand, with institutional support from government and industry associations, would create a resilient sector that is future ready and able to scale to take advantage of new opportunities.

Increasing South Africa's GBS capacity and global market share could result in a strong net employment generation effect among mid-and high-skilled workers if the sector is flexible enough to scale.[8] South Africa's share of the global GBS market was 1% in 2014, projected to

[5] *Ibid.*
[6] *Ibid.*
[7] Everest Global, InvestSA & Business Process Enabling SA (2018). South Africa's BPO industry-Pivoted for the next generation delivery
[8] Genesis Analytics Team Analysis, 2019

rise to only 3% in 2030.[9] However, the sector has already created 200,000 jobs, and a further 50,000 new jobs have been set as a target for 2022.[10] These jobs are highly concentrated in Gauteng, Kwa-Zulu Natal and the Western Cape however 55% of the industry's FTEs qualify as impact workers and demonstrate the industry's ability to create inclusive opportunities.

South African companies have already started competing on a small scale in outsourced digital jobs, and it is possible for South African GBS providers to re-define their value proposition, develop appropriate capabilities, and market this value proposition to the global market over the next 3 years. South Africa has a strong competence in the skills that will be foundational to support digital jobs. If South Africa can transition quickly enough, the GBS sector could achieve scale and create more employment. However, the opportunity cost of not realizing this opportunity is high because international providers are already transitioning to provide these next-generation services.

South African freelancers that can capture global demand

South Africa's language, time-zone, and quality competitive advantages creates an opportunity to leverage the employment opportunities presented by global freelance platforms.[11] Both companies and individuals are presented with an opportunity to become part of a global value chain that is opening South Africa up to the global demand and supply of jobs. Some examples of freelance jobs that South Africa may have a strong value proposition in are virtual tutors, finance & legal consultants, web designers, and digital marketers, among many other examples.[12]

With freelance platforms such as Up-work and Fiverr connecting freelancers to more than 180 countries, South Africa could establish a high quality, low-cost value proposition that could result in significant employment opportunities for South African freelancers. Freelancers in South Africa are likely highly skilled professionals – in the media industry about 48% hold a bachelors or honours degree and 16% hold a Masters or equivalent qualification.[13] This industry has healthy growth with 40% of a survey of freelancers detailing they have been working in the market for less than 5 years[14]. For many, freelance work provides a primary source of income while for others it provides a supplementary source to their full-time job. A scoping of the South African micro-work industry (of which freelancing forms part) found 60% of microwork participants were employed, 7% self-employed and 15% unemployed.[15]. Freelancing is therefore a key source of new employment opportunity and could have significant economy wide effects if South Africa follows the trajectory of comparators - in Sri Lanka, 0.1% of the population freelance however there is a 44% annual uptake on this figure[16].

[9] Business Enabling Process SA (2018). South Africa Business Process Services Key Indicator Report
[10] Everest Global, InvestSA & Business Process Enabling SA (2018). South Africa's BPO industry-Pivoted for the next generation delivery
[11] Business Enabling Process SA (2018). South Africa Business Process Services Key Indicator Report
[12]Southern African Freelancers' Association (SAFREA). SA Media Freelance Industry and Rates Report 2017-2018.
[13] *Ibid*.
[14] Online Media – *The state of Freelancing in South Africa, 2019*
15 RICT Africa, What is the State of MicroWork in Africa, 2017
[16] *Ibid.*

As the global market becomes better connected, scaling these opportunities is not limited by domestic demand. Freelance work also has relatively low barriers to entry - with marketing and administration covered by global freelancing platforms, South Africans can relatively easily access new sources of global demand. These freelancers are generally offering their services at a lower cost than the source countries where outsourcing demand originates from. As these opportunities require a range of baseline of expertise there is opportunity for targeted scaling.

Unlocking local demand for low-skilled labour through digital platforms

The digital age has seen the emergence of digital platforms that aggregate and match supply and demand for services offered by low-skilled labour. This broad range of low-skill labour can benefit from platforms that generate efficiency gains and result in better and cheaper services in the domestic economy. Efficiency gains and cost reductions have the potential to unlock latent demand and increase the addressable market for low-skilled labour, thereby creating additional income-generating opportunities for low-skilled individuals.

Similar opportunities are being created by the rising usage of digital platforms for the purchase of products. Digital commerce is growing rapidly in South Africa at a compound annual revenue growth rate of 81.7% from 2015 to 2018[17,18,19] **.** This rapid growth is expected to continue. Consumer usage of these platforms is creating demand for delivery services which can be filled by independent drivers. In addition, product producing entrepreneurs and SMMEs are provided with improved and wider access to consumers which offer further income opportunities among emerging businesses.

Rising smartphone penetration and digital platforms provide an opportunity to link the informal labour market with the formal economy where there are more and higher quality income-generating opportunities. South Africa has a growing smartphone penetration that was at 51% in 2018 and is expected to rise to 72% in 2019[20,21]. These devices provide individuals with access to digital platforms. Digital platforms that create latent demand by making low skill labour easily accessible are particularly important as 71%[10] of South Africa's labour force operates in low- and semi-skilled sectors where there is a high incidence of informal employment. Low-skilled individuals are also often at the highest risk of displacement by automation in the formal wage market, so generating additional income-generating opportunities among this group is particularly important for economic inclusion.

While these platforms may provide income-seekers with access to higher quality jobs and greater access to value-added services such as payments, credit and insurance - there are also risks. It is unclear whether participating in these platforms will provide better quality work as the opportunities they create could be eroded by poor bargaining power among platform participants and a race to the bottom for pricing. However, the greatest employment-creation risk is that these digital income-generating opportunities will displace existing work opportunities in low-skill labour markets.

[17] Qwerty, The digital landscape in South Africa, 2017
[18] News articles, 2016-2018
[19] Labour market dynamics in South Africa, 2017
[20] Internet Connectivity seen as having a positive impact on life in Sub-Saharan Africa, Pew Research Centre, 2018
[21] Genesis Analytics team analysis, 2018 | Total mobile subscription forecast is based on historical growth, using this we estimate the smartphone penetration using a diminishing marginal forecast based on real GDP growth

South African based platforms may offer additional opportunities and avenues to leverage gains and minimise market tensions. International platforms operating in South Africa are valuable sources of employment opportunity. Localised platforms competing with international platforms in South Africa may be able to offer similar and additional benefits. Firstly, these platforms may be more responsive to local needs. Uber's operations in South Africa provides an example. As Uber is located in San Francisco, changes in petrol prices in South Africa are not matched with changes to rates which would account for the increased operating costs drivers face. Secondly, localised platforms also allow South Africa to localise and preserve the income of these platforms. Lastly, a local business could scale into Africa and other markets and create additional income flows for the South African economy.

For these digital opportunities to really scale income-generating work, it is critical that there are mechanisms which increase the demand for low-skill individuals. Two mechanisms of demand are key for digital platforms. Firstly, *unlocking latent demand* is achieved where platforms create efficiency gains for consumers and reduce non-financial impediments to accessing goods and services. This attracts people who otherwise wouldn't make use of low-skill services because of high search costs, high costs of exchange or an inability to verify credentials. It also expands demand for goods ordered on digital platforms that can be accessed with less time and effort. Secondly, through unlocking new consumer markets by *reducing costs* of goods and services. Digital platforms that aggregate services and provide access to products can have a significant cost-reducing effect which can expand access to mid to lower income earning consumers. This is driven by increased competition and lean, innovative operating models that reduce business costs. Disruptive platforms tend to exhibit both of these mechanisms.

Platforms creating opportunities for low skilled labour are classified into three groups according to the core service they provide. Platforms can be classified along multiple dimensions. For example, the gig-economy relates to the nature of work, the sharing economy relates to asset ownership while the on-demand economy relates to the pace at which consumer demands are fulfilled. The perspective from which the platform is viewed therefore comes to define its classification. The following assesses how cost and efficiency effects create income opportunities across 3 platforms classifications. This taxonomy takes the perspective of the core service provided which informs the nature of work required. These three classes are direct labour and short-term jobs, transportation and travel, and accommodation and tourism. Innovation in the platform market may see the emergence of completely new services which may create similar low-skill labour opportunities.

Direct Labour and Short-Term Jobs

Labour matching platforms reduce frictions and information asymmetries in low-skill labour markets by creating trust and providing a single platform for workers/businesses to list their services and search for customers/employers who require their services. A number of constraints create inefficient low-skill labour markets: high costs of work and worker searching, reliance on referrals, and customers or employers being unable to verify the credibility of work-seekers. Digital Labour-matching platforms can address a number of these constraints and decrease the cost of labour exchange. Many of these platforms have a screening functionality that provides background and verification checks on all job-seekers while customers and employers have to register to use the platform using verifiable details. These platforms often have central rating systems for both supply and demand participants.

Domestic services are an area where labour-matching platforms have created direct labour and short-term job opportunities. On-demand cleaning service platforms such as Domestly and SweepSouth have created 600 and 3,000 income opportunities for previously unemployed & underemployed individuals in one year, respectively[22].The ease of searching, increase in trust, and convenience of on-demand services when using these digital platforms unlocks latent demand among customers that would not previously choose to use domestic cleaning services.

Emerging platforms without an industry focus that create a market-place for labour may create similar income generating opportunities. The Clockwork app markets itself as a blue-collar labour matching platform which provides consumers with access to a variety of low-skill labour providers. The platforms vets and scores service providers and provides users with a list of possible job-seekers who are most appropriate for the task based on an assessment of task requirements and job-seeker capabilities.

Transportation and Delivery

Digital platforms that transport people and deliver goods have seen considerable growth and created demand for low-skill labour. For people seeking transport, platforms such as Uber offer services at a lower cost to traditional providers and offer similar efficiency gains as labour matching platforms. In the product market, the cost-effectiveness of e-commerce and ease of ordering on these platforms is quickly being recognised by consumers and seeing rapid growth in demand. Both of these platforms are creating significant low-skill employment opportunities from the demand for logistics and transport services at the front-end of these supply chains. E-commerce platforms that improve consumer access to products, are creating further employment effects at the back-end of the supply chain for small scale producers and entrepreneurs who have new opportunities to scale. The following firstly details the opportunities for drivers created by the transportation and delivery market and secondly the income generating opportunities for small-scale businesses.

[22] *Ibid.*

Taxi services have been disrupted by the cost reductions and efficiency gains of emerging platforms and created significant demand for drivers. South Africa's taxi industry was a case of poor demand and supply matching - with minibus taxis servicing the lower income market and metered taxis servicing the higher income market, a gap existed in the middle-market. Uber and Taxify have transformed the taxi industry and created additional income opportunities by supplying an affordable, easily accessible and transparent taxi service. This service offered fares almost 265% lower than incumbent providers[23]. In 2006, there were 8,286[24] active meter taxi drivers. In 2018 Uber and Taxify collectively had a total of 18,000 active drivers, with average gross earnings per month of R16,000 – R36,000 – attractive relative to the R20,000 average monthly salary in the non-agriculture sector[2526]. If driver remuneration is assumed to be between 70% - 90% of trip fares, total driver earnings are between R327- R421 million per year. While broadly accessible, concerns for inclusivity in the taxi market are raised by a gender bias –approximately 4% of South African Uber drivers are women[2728]. Concerns for safety have been cited as the root cause of skewness in the taxi industry suggesting enhanced security features will contribute to economic inclusivity.

Door-to-door delivery services in the online food market are providing opportunities for low-skilled drivers to earn income on platforms that link available drivers to restaurant food deliveries. In the US, the online food delivery market is projected to grow from 42% in 2017 to 58% in 2020. This is driven by rising consumer demand - in 2018, 26% of respondents in the US ordered food for delivery at least once a week, while 86% use it at least once a month. South Africa - at a lower base than the US - is catching up quickly with a 64% increase in food delivery projected through to 2023. Mr D, one of South Africa's largest food delivery platforms, saw a 210% growth in 2017 alone[29]. In 2019, the application saw a threefold rise in the number of drivers to 3,000 in one year[30]. Using the ratio of downloads to drivers, Uber Eats likely has 1,200 drivers. If drivers have a fixed capacity and the driver market is not over-subscribed, food delivery jobs should grow at the same rate as the market This market remains under-penetrated and is expected to continue to see substantial growth going forward as new entrants like Uber Eats and Order In start to scale.

The increasing popularity of e-commerce is providing opportunities for digital commerce start-ups to access consumer markets and scale. Digital platforms can offer products at reduced costs as they leverage economies of scale and avoid some burdensome fixed costs such as store rental. In South Africa consumer demand on these platforms is rising with prices on e-commerce platforms estimated to be 5% cheaper than offered at physical retailers[31]. Digital commerce platforms like Superbalist, Takealot, Zando, Yuppichef, and the many start-up stores that offer online shopping and delivery services will continue growing quickly and may become important employment creators in their own right. Low-skill workers are being

[23] Ndlovu, Uber vs. Metered Taxis: A Competition Issue or a Regulatory Nightmare, 2017
[24] The Job creating Potential of the Metered Taxi Industry in South Africa's Urban areas, S Lowitt, 2006
[25] Online Media: *How much money you can make as an Uber driver in Johannesburg*, Myboradband, 2017
[26] StatsSA, QES, 2018
[27] RICTAfrica, What is the State of Microwork in Africa?, 2018
[28] Online Media – *South Africa's female Uber drivers feel unsafe and the firm wants to fix that* – HyperText, 2018
[29] Online Media: *Fast food deliveries are exploding in South Africa* - Business Insider, 2018
[30] Online Media – *SA's fast food sector gets up to speed* – Financial Mail, 2019
31 Online Media: Online Shopping Grows in South Africa – IOL, 2018

demanded in fulfilment centres, to transport goods from warehouses to depots and to deliver goods to customers. From 2013 to 2018, China's Alibaba tripled its workforce to over 60,000 employees, while Amazon's workforce has increased more than tenfold in the last decade with over 500,000 workers in 2018[32]. In South Africa it is possible that this job growth from logistics and transport in e-commerce may even outstrip the loss of low-skilled brick-and-mortar retail jobs as the time customers usually spend shopping themselves is monetised via delivery charges[33].

Digital platforms offering the delivery of goods are providing start-ups and entrepreneurs with access to consumer markets which may help them to scale The Khula app provides small-holders farmers and drivers with access to warehouse management facilities and on-selling of products to consumers through an e-commerce platform. This provides consumers who demand and value foods organically grown by small-scale businesses with an efficient way to access them. Income opportunities are created by smallholder farmers who can scale their operations above subsistence and sell surpluses through digitally enabled supply chains. This could create labour opportunities in the farming sector. With an estimated 4 million smallholder farmers - which 160,000 produce goods for sale – the scale of this opportunity could be significant. While the bulk of digital platforms cater to individuals and consumers in urban centres, platforms that provide producing entrepreneurs access to new markets may offset this metro-centricity extend income creating opportunities beyond city borders.

As similar platforms emerge and scale in the transport and delivery markets, the efficiency gains and cost savings effects could generate significant additional income-generating opportunities.

Accommodation and Tourism

Aggregating digital platforms are creating income opportunities for low scale labour in the accommodation and tourism market by reducing barriers to entry. A one-night stay at a hotel in Johannesburg starts from R1,200 while Airbnb offers accommodation for as little as R250 per night[34,35]. Airbnb helps to significantly reduce the accommodation costs for tourists by allowing home-owners to offer accommodation services on the platform. This has resulted in more people being able to afford travel to and within South Africa. The home sharing platform has allowed South Africa to welcome more tourists in a scalable and sustainable manner. This has created significant direct and indirect income opportunities: from June 2017 to June 2018, Airbnb directly and indirectly generated an estimated R8.7bn in economic impact- equivalent to 22,000 income opportunities in a single year[36].

Airbnb is a particularly interesting example because of the value-added services offered to the tourists using the platform. Tourists are able to book "experiences" on the platform where there is a growing community of entrepreneurs and informal tour operators who serve as

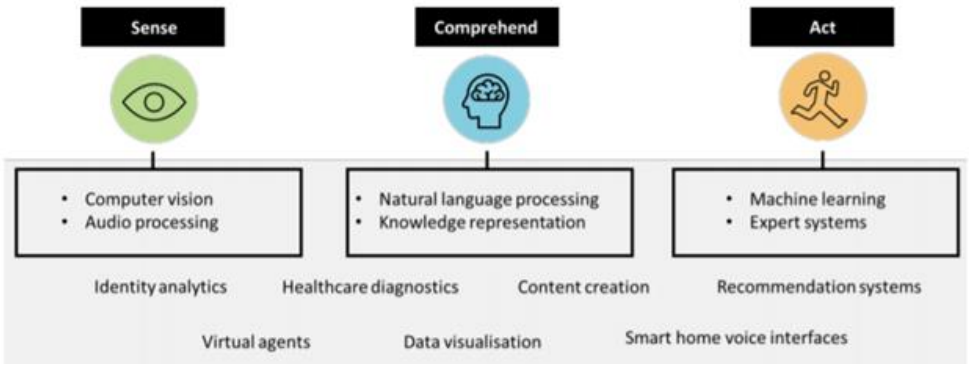
[32] Statista, 2018, *Alibaba: Number of Employees from 2012 to 2018*, online: https://www.statista.com/statistics/226794/number-of-employees-at-alibabacom/ and *Amazon: Number of Employees from 2007 to 2018*
[33] Mandel, 2017. *How Ecommerce Creates Jobs and Reduces Inequality*. Progressive Policy Institute.
[34] Airbnb, 2019
[35] Trivago, 2019
[36] Airbnb in South Africa: The positive impact of Healthy Tourism, 2008

tour guides and offer other tourism and leisure activities, often within their own homes. This has particular application for low-skilled individuals that can access income-generating opportunities through the platform without having to be homeowners. With 95% of hosts recommending local businesses to their guests, the income opportunities that arise because of Airbnb are expected to continue to see a steady increase as the addressable tourism market increases[37]. While sharing economy related platforms such as AirBnB broaden opportunity they continue to concentrate economic returns in asset holders.

[37] Airbnb in South Africa: The positive impact of Healthy Tourism, 2008

Establishing South Africa as a regional hub for frontier technology

Frontier technologies such as the internet-of-things (IOT), drones, and robotics are transforming the way businesses operate, individuals interact and how value is created. Key to a host of these technologies is what some consider an emerging factor of production - artificial intelligence (AI). AI – the algorithmic layer of frontier technology - is combined with the hardware layers of drones, IOT and robotics to improve their range of capabilities and areas of application. Business, government and consumer demand for these technologies is on the rise as proof-of-concept translates into proven return-on-investment.



Source: AI for Africa: An Opportunity for Growth, Development and Democratisation, UP, NY

The adoption and development of these technologies is creating three key areas of employment opportunity. First and most importantly, the adoption of frontier technology will reshape how sectors like agriculture, mining and many others operate. This will unlock new forms of production and create new employment opportunities across a diverse range of industries and across businesses of varying maturities. Deepening adoption is therefore key to unlocking economy-wide employment and productivity effects. Secondly, complementary high-tech-skills such as AI, data engineering, and software engineering are all required to develop and deploy these innovations. A local capability can help deepen industry adoption and help to fully realise the economy-wide employment opportunities presented by these technologies. Finally, employment will be created by the deployment and maintenance of ICT and digital infrastructure required to keep businesses of all sizes and maturities abreast with the digital age. This will drive the demand for more common tech skills such as IT sales and support, cloud computing and information security.

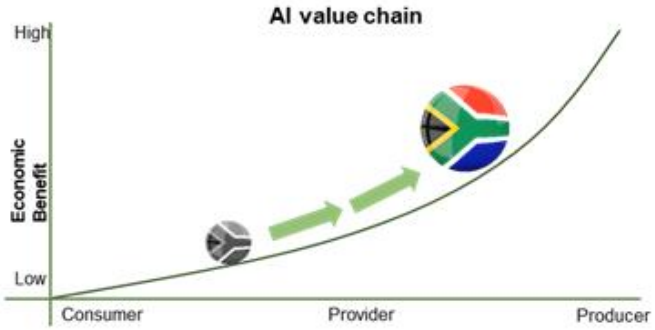
The following details these employment opportunities starting from the narrow employment creating development phase to the broader employment creating implementation phase.

Scaling the supply of technology skills to meet growing demand

South Africa has the opportunity to supply the growing domestic and regional demand for technology skills. Global demand for AI expertise and related support teams is in the millions,

outstripping supply by between 5 and 10 to 1[38]. This gap is likely to remain in the medium term as frontier technology adoption deepens across industries driving growth in AI and related investment by 37% each year for the next 3 years[39]. Demand for frontier technology solutions is driven by business pursuit of profitability and new opportunities, and government pursuit of efficiency in service delivery and the management of citizens. These end-users are pressured to use the latest technologies to remain competitive and meet growing citizen and customer expectations. The demand for frontier technology creates new job opportunities for individuals who have access to high quality education but also strengthens demand for ICT support skills.

Supplying the skills to meet growing local and regional demand would require South Africa reposition itself up the AI value-chain from a consumer to provider. Countries such as China and the US - the sources of globally-scaled solutions such as IBM Watson - are the apex producers of AI technology globally. While it is unlikely that South Africa could replicate this *producer* role, there is the potential for South Africa to leverage its current capabilities and deepen its *provider* role in servicing unmet local and regional demand for independently developed, context relevant solutions using frontier technology. This includes delivering and deploying internationally developed solutions in local market contexts, enabling innovation and research to unlock local industry application of frontier technologies, and creating an attractive environment for research and development that motivates foreign firms to use South Africa as a cost-competitive platform for innovating. South Africa is currently a regional leader in frontier technologies and hosts a number of multi-national tech companies such as IBM and Microsoft continent operations. However regional competitors such as Kenya and Nigeria are actively encroaching on South Africa's position.



The scaling required for South Africa to play this role would create direct employment opportunities among high-tech skilled workers, and generate strong multipliers among a range of related tech and non-tech services. For each job the frontier technology industry fills, multipliers are likely in the range of 7 to 10, as each job needs to be supported by the host of complementary functions that make the development and deployment of these technologies possible.[40,41] A new supply of just 6,000 frontier technology practitioners – less than half the unfilled AI demand in London – could raise South African employment by almost half a percent. This figure is not infeasible and equates 1 practitioner for every 13 registered businesses in South Africa.

38 Tencent, Global AI Talent Assessment, 2017
[39] International Data Corporation. 2018. Worldwide Semi-Annual Cognitive Artificial Intelligence Systems Spending Guide.
[40] Goos *et. Al.* 2015. *Employment Growth in Europe: The Roles of Innovation, Local Job Multipliers and Institutions*
[41] Wright, J. 2017. Measuring Innovation and Economic Impacts in the Tech Industry

Sophisticated tech related skills such as AI and data science are those most in shortage in the ICT sector, however these skills are of high quality[42]. South Africa leads the continent in the number and impact of AI-related academic publications with an equally strong presence in other frontier technologies such as robotics, IOT and quantum computing. A host of local firms develop and deploy these technologies and are expanding representation to foreign markets. These capabilities are better positioned for scaling with the recent establishment of a Microsoft Azure data centre in Cape Town and the recognition of the city as one of the globe's 30 most attractive technology and start-up destinations – both a first for the continent.

These skills are demanded by start-ups creating new consumer products and services, businesses that support the digital needs of established corporates, and corporates seeking to integrate new and expand current digital capabilities in their organisation. South African corporates are in the early stages of frontier technology adoption implying the demand for practitioners is set to grow. These players as well as less digitally sophisticated SMEs will demand ICT service providers that enable business participation in digital value chains and leverage process efficiency enhancements offered by information technologies. The SME sector will become a key source of demand for ICT related skills. Digitally oriented SMEs with an appetite for frontier technologies will drive demand for practitioners while SMEs seeking to digitally enable their business will require sales and maintenance support. In the latter case, the opportunity is significant as nearly 35% of SMEs never make use of cloud services nor e-commerce[43]. Assuming one service provider can service 10 businesses and that a quarter of formal micro-enterprises have appetite for digital services, nearly 50,000 ICT service providers are required to meet the needs of un-serviced SMMEs[44].

Creating new forms of work opportunities through frontier technology adoption

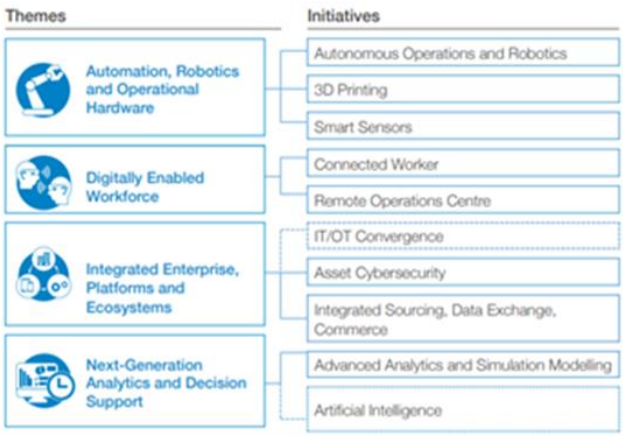
A frontier technology hub will help a diverse range of South African industries adopt technology more quickly and create new growth and employment opportunities however this will likely displace labour. The provision of quality and affordable high-tech services in conjunction with local market knowledge can accelerate market maturity and deepen market adoption. Emerging market tech hubs are already seeing the benefit of local specialisation – for example China is solving for an inadequate supply of health services, and India is seeking to improve yields and productivity along the agriculture value chain through the application of AI[45]. The effective application of AI and frontier technology could accelerate South African annual GDP growth by 1%, with enhanced profitability and value creation and create new forms of employment in adopting industries[46,47]. Should South African target the application of these technologies in the same industries targeted in India's AI strategy, adoption could

[42] JCSE. 2019. ICT Skills Survey
[43] SME South Africa, An Assessment of South Africa's SME Landscape, 2018
[44] Genesis analytics estimate (2019) – market size of SMMEs drawn from FinFind, 2017, Inaugural South African SMME Access to Finance Report
[45] Government of India. 2018. National Strategy for Artificial Intelligence – Discussion Paper
[46] Accenture. 2017. Artificial Intelligence: Is South Africa Ready?
47 DBSA, An Overview of the demand for skills for an inclusive growth path, 2010

touch 30% of South Africa's labour force[48,49]. This would furthermore offset the concentration of benefits in urban metros associated with the creation of ICT enhanced jobs. The application of these technologies is not without significant risk when considering net employment – automation can and will displace labour. However, the opportunities offered by frontier technology adoption can partly offset this by creating new forms and sources of employment demand.

The mining industry illustrates the trade-offs frontier technology adoption creates and the opportunity these technologies have for the ailing South African mining sector. Over the next decade, digitisation and the adoption of frontier technologies in the mining and metals industry globally could create almost USD 420 billion in value for customers, society and the environment while saving 1,000 lives and preventing 44,000 injuries. However, these gains may come at the cost of 330,000 jobs[50].These technologies may unlock new mining operating models and opportunities. In South Africa, this may help address the decade of sliding profitability and productivity that has been driven by rising cost-pressures, ageing mines and falling labour productivity. The mining industry has a 400,000 strong labour force, have employment multipliers between 2 and 4 and supports 4.5 million dependents[51]. With nearly 47% of South Africa's mining labour force and 37% of revenues in the bottom quartile of global cost competitiveness, significant value and employment are at stake.[52,53] In the absence of intervention, the sector may bleed 52,000 jobs or 13% of employment by 2030.[54]

A future of mining that leverages frontier technologies could recover competitiveness and support the sector's employment contribution. Transformation of the industry will see select activities automated, labour and capital augmented and cohorts of employment oriented towards more complex tasks. The effective application of technology may induce mining labour losses in the range of 5%[55]. However, the revitalisation of the industry will ensure that those that remain are securely employed and could raise revenues by up to 3% and profits by 9%[56]. Revenues created for the fiscus could be used to support labour in transition. Technology implementation may also lead to growth in the industry growth and offset labour losses by making smaller deposits that were



Source: World Economic Forum. 2017. Digital Transformation Initiative: Mining and Metals Industry

48 Government of India. 2018. National Strategy for Artificial Intelligence – Discussion Paper
49 StatsSa, QLFS, 2018
50 World Economic Forum. 2017. Digital Transformation Initiative: Mining and Metals Industry
51 Chamber of Mines. 2015. The Future of the South African Mining Industry.
52 BCG. 2018. Working Together to Reenergise the South African Mining Industry.
53 McKinsey & Company. 2019. Putting the Shine back into South African Mining: A path to competitiveness and growth.
54 BCG, Working Together to Reenergize the South African Mining Industry, NY
55 World Economic Forum. 2017. Digital Transformation Initiative: Mining and Metals Industry
56 *Ibid*

previously unprofitable to mine profitable. The way these deposits are mined may be very different to current methods creating new forms of labour.

Businesses across all industries characterised by flexible operating models are better positioned to improve productivity through the use of frontier technology. These businesses can more successfully integrate frontier technologies into current processes or develop new processes around these technologies. These models improve businesses' ability to pivot to changing conditions and pursue new opportunities - regardless of whether the technology adopted was developed internally or delivered by an external service provider. This possibility of new business models unlocked by frontier technology, and the associated employment opportunities they provide, are as applicable in mining as they are in number of other industries such as agriculture and manufacturing.

PART B: READINESS ASSESSMENT

This readiness assessment section identifies the conditions required for economic opportunities to be realised and scaled. Having defined three broad areas of opportunity that South Africa could realistically pursue, it is important to then identify what it would take to ensure these opportunities could materialize. This section details the readiness conditions that need to be in place for South Africa to take up digital economic opportunities in the future, and for these opportunities to be meaningfully inclusive.

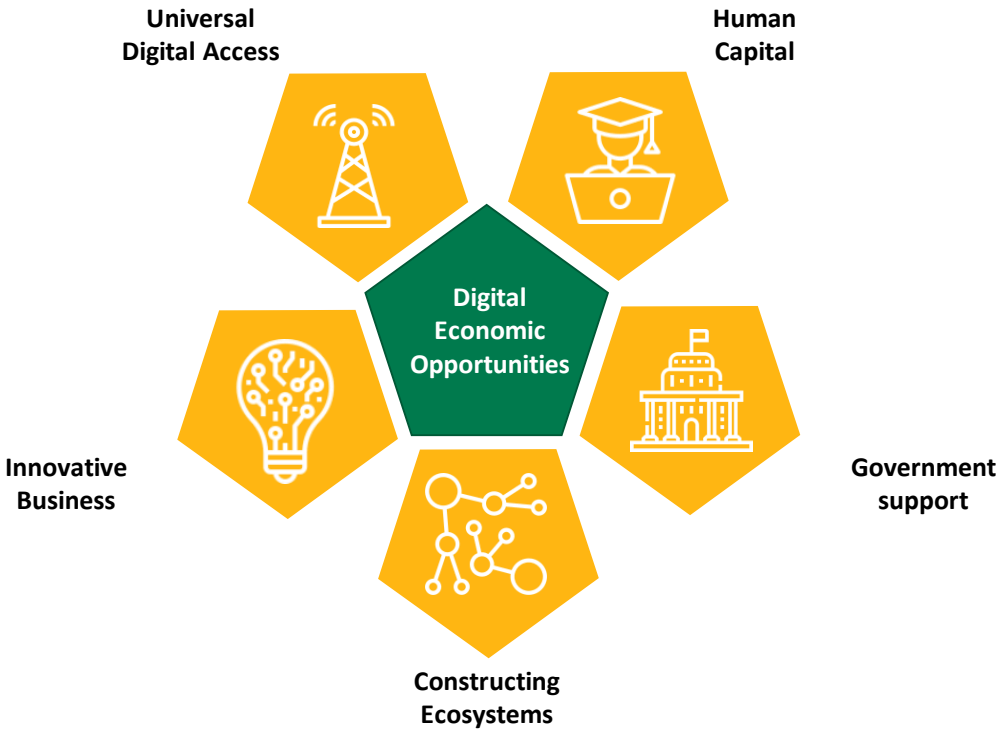
These readiness conditions are synthesized into five broad pillars. The identified readiness conditions were grouped together into the pillars of Universal Access to the Digital Economy; Human Capital; Government Support; Innovative Business; and Constructing Ecosystems. These five pillars constitute the main areas of readiness that South Africa will have to get in order to scale digital economic opportunities and ensure inclusion.

The assessment analyses the current state of play of the readiness conditions within each of the five pillars. This is done through a future-oriented lens. Rather than speculating on how the conditions will play out over the next ten years, the assessment considers whether current conditions are on track to support future economic opportunities, and where gaps remain.

This includes a consideration of the drivers of change for each condition and the extent to which gaps are being closed. Where significant gaps exist, part of South Africa's readiness for future economic opportunities is defined by whether there is momentum to close these gaps going forward. As such, the readiness measurement includes a consideration of both the size of the gap and the dynamics that are leading to the gap shrinking or growing over time.

Each pillar is summarised from the perspective of inclusivity. This summary evaluates the importance of the pillar in ensuring emerging economic opportunities are inclusive, and measures the pillars's gap in achieving this.

The five readiness pillars are described in brief below and elaborated on in this section:



The **Universal Digital Access** pillar considers whether all South Africans have access to the digital economy in order to take advantage of digital economic opportunities. It considers the state of the country's digital infrastructure, of ICT regulation, and of device and data affordability across various geographies and demographics.

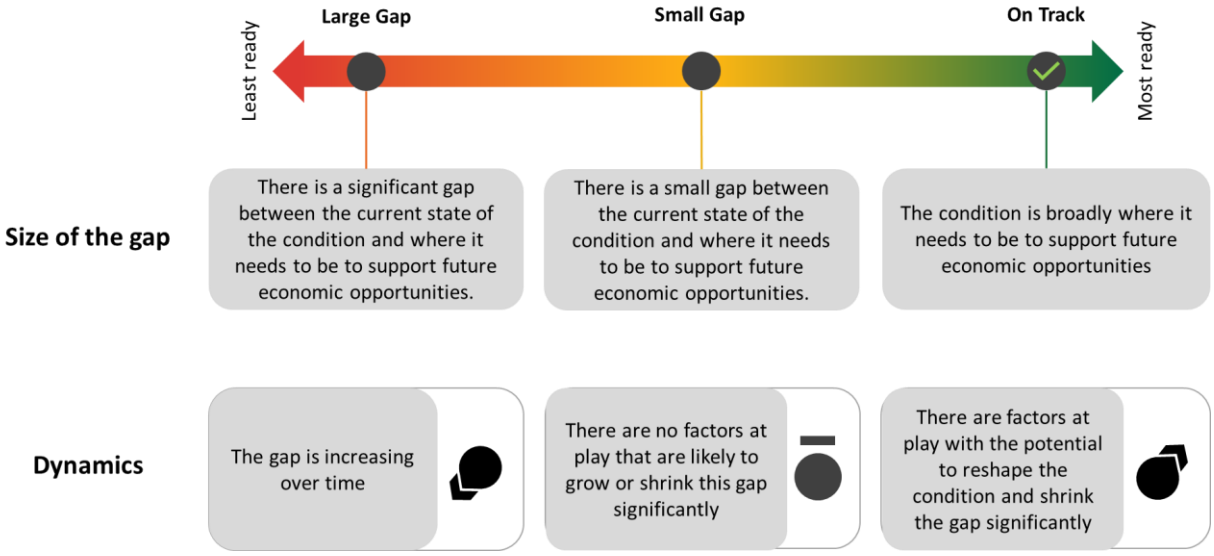
The **Human Capital** pillar considers whether South Africa's education ecosystem is sufficiently preparing individuals with the skills and talent that will be demanded by private sector and other organisations as digital economic opportunities are scaled. It includes considerations of the state of basic and secondary schooling, and the flexibility and relevance of tertiary education pathways.

The **Government Support** pillar considers whether the public sector in South Africa is adequately prepared to support the new types of opportunities that may emerge. It includes the role of government as a regulator of business, as a manager of fiscal tools, as a bridge for the poor to access digital opportunities, and as a regulator of labour markets.

The **Innovative Business** category considers whether private sector stakeholders and support systems are adequately prepared to respond to and scale economic opportunities presented by the digital age. It considers the processes required for new business models to be developed and scaled, and whether there are adequate inputs into those processes (such as entrepreneurship, innovation financing, and the diffusion of technology across markets).

The **Constructing Ecosystems** category considers whether there are sufficient organisations and processes that link up and co-ordinate stakeholders that usually operate in silos. Co-ordinating different stakeholders around a specific opportunity is critical to the opportunity's ability to be scaled. This includes considerations of business-to-business co-ordination, public private solutioning, the presence of market facilitators, and access to global markets and ideas.

Collectively these pillars constitute the framework for assessing South Africa's readiness to take up future economic opportunities. Readiness is categorised based on the size of readiness gaps, and considerations of dynamics (whether the gap is likely to shrink or grow). As shown in the diagram below, the degrees of readiness are placed on a spectrum from least ready to most ready. A description of each readiness degree is provided.



Universal Digital Access

Universal access to the digital economy is a basic prerequisite for leveraging digital economic opportunities. Location and affordability should not prohibit access to digital opportunities if these are to be accessible to all South Africans. This access is predicated on the coverage and quality of infrastructure, reliable internet connections, fit-for-purpose telco regulation, and the affordability of data and devices. These are the key areas measured in this pillar.

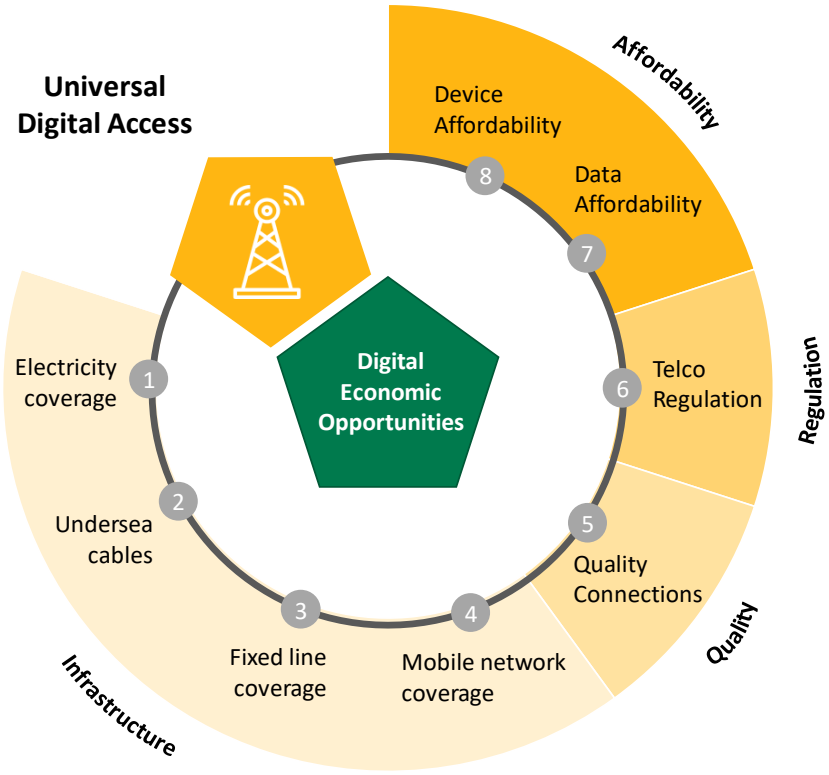
All digitally-enabled opportunities are reliant on a well-developed and high quality network of digital infrastructure. This includes the coverage of fixed line and mobile connections, and the electricity and undersea cable infrastructure that supports South Africans being able to access and transfer data with global markets. While these cut across all opportunities, the scale and sophistication of the infrastructure that is required varies. Opportunities in globally-traded services, for example, often require fixed line connections which are typically cheaper than mobile connection for transmitting large amounts of data. Digital platforms that absorb low-skilled labour, however, often rely on good mobile network coverage as participants typically connect through a mobile device.

In addition to the coverage of digital infrastructure, having good quality connections that are fast and reliable are essential. In particular, many of the digital business models unlocked through frontier technologies require the reliable and fast transfer of high volumes of data. However, even for individuals accessing opportunities in the digital economy, poor quality connections with frequent downtime can prevent people from carrying out income-generating work.

The regulation of telecommunication infrastructure and services has a direct impact on the coverage and quality of digital connectivity. This includes considerations of competition amongst telecommunication providers, as well as regulatory issues such as spectrum allocation and mobile termination rates.

Affordable internet connections and hardware is a critical requirement for individuals and businesses. Affordable internet connectivity and hardware is required for all opportunities, but each opportunity has slightly different requirements. Low-income individuals participating in digital platforms need to be able to purchase relatively small amounts of data at affordable rates. Having data is a prerequisite to earning income from the platform which may only be aggregated and paid at weekly or monthly intervals. For the South African globally traded services sector to transition towards a larger share of the global market, a key consideration is the cost of fixed line connectivity.

The specific readiness conditions to be measured are listed in the diagram below, and a summary of the measurement for each condition follows thereafter. The full detail of the condition measurement is available in Appendix I.



Infrastructure

1 Extensive coverage of electricity is required as a basic enabler of digital participation. There is a **large and widening gap** in South Africa's electricity coverage. Although only 15% of the population is permanently unable to access electricity, load-shedding has been ongoing for the last 10 years[1]. South Africa ranks below BRIC nations and the global median in the quality of electricity supply[2]. The ailing public power utility creates financial duress for consumers and business with the real price of energy rising substantially since 2007. The duress this places on the economy is compounded by the continued financial support needed from and provided by the fiscus – anticipated at R70bn a year for the next 3 years[3]. Although investment in renewables that reduces reliance on the grid is growing, historical corrective actions for the utility have been unsuccessful and demand growth will likely continue to outpace the grid's supply.

Select Measurements from Appendix	Score	Source
Electricity Access *(% of population)*	84.2%	World Bank
Electricity Access (*% of rural population)*	67%	World Bank
Quality of Electricity Supply (*country rank)*	97/137 (1 is best)	WEF Global Competitiveness Index
Quality of Electricity Infrastructure *(country rank)*	98/ 140 (1 is best)	WEF Global Competitiveness Index
Real Electricity Price Rise (07/08 – 15/16) *(%)*	147%	Deloitte

2 The presence of high-quality undersea cables is necessary to support the transport of South African and global broadband. Undersea cables in South Africa are **on track**. South

Africa is ranked 18 of 139 countries in terms of bandwidth per user and is well placed to compete in the global digital market[4]. Six undersea cables connect South Africa to the rest of the world, and the open access models of undersea operators will motivate continued investment through competition.

Select Measurements from Appendix	Score	Source
Number of undersea cable connections	6	TeleGeography
International Internet Bandwidth per user *(kb/s)*	149.5 kb/s	WEF Global IT Report
International Internet Bandwidth per user *(country rank)*	18/139 (1 is best)	WEF Global IT Report

3 **Well-developed coverage of fixed line connections provide businesses and individuals with connectivity and a means of digital participation**. There is a **large though narrowing gap** in fixed line coverage in South Africa. South Africa ranks 139 of 190 countries in fixed broad-band penetration[5]. Fixed line and fibre networks are most prominent in high-income metropolitan areas with Fiber-To-The-House (FTTH) servicing only 2% of internet connected households, and urban areas 15 times more likely to have fixed line coverage than rural areas[6]. Disparities in access between rural and urban populations are therefore large, however far smaller than other African markets[7]. The lack of rural fixed line infrastructure and high costs make fixed line connections inaccessible for low income and rural businesses who must rely on less stable mobile networks and the purchase of costly data bundles as an alternative. This disadvantages SMMEs, businesses and workers seeking to compete in the digital world if they operate outside of metropolitan areas or have low levels of income. Competitive forces are however motivating expanding coverage.

Select Measurements from Appendix	Score	Source
Fixed-broadband subscription per 100 inhabitants (*country rank)*	139/190	ITU
Household Access to Fibre (*%)*	2%	RIA After Access Survey
Household access to fixed line (*Rural, %)*	0.7%	RIA After Access Survey
Household access to fixed line (*Urban, %)*	11%	RIA After Access Survey
SMMEs without fixed line access (%)	46%	SME South Africa Landscape Survey

4 **Extensive coverage of mobile networks are an important means of connectivity, particularly for individuals and micro-entrepreneurs**. Mobile network coverage in South Africa is **on-track**. Approximately 99.9% of South Africa's population have access to mobile networks, 99% have access to 3G and more than 80% access to 4G – up from 53% in 2015[89]. While 3G networks are inferior in speed to 4G networks, 4G access is expanding as mobile operators continue to make large investments aimed at improving next-generation networks. The gap in 4G access will be outstripped by the gap in 5G networks once the anticipated launch of 5G occurs in late 2019.

Select Measurements from Appendix	Score	Source
Mobile network coverage (*% of population)*	99.9%	WEF Global IT Report
3G network coverage (*% of population)*	99%	ICASA ICT Sector Report
4G/LTE network coverage (*% of population*)	77%	ICASA ICT Sector Report
Phone as internet device used by households (*% of households)*	43%	RIA After Access Survey

Quality connections

5 **High quality connections that are fast and reliable are required for businesses and individuals alike**. There is a **small though closing gap** in the quality of South Africa's connectivity. Fixed line speeds are more than 50% below the global average placing South Africa at an unfavourable position compared to competitors such as China, Brazil and USA[10]. South African businesses far exceed the global average in reporting slow or challenging internet activity[11]. However, these speeds are rising while the National Treasury has allocated R1.9 billion to South Africa Connect to invest in high-speed internet connections. Connection quality for mobile networks is far superior with speeds above global averages[12].

Select Measurements from Appendix	Score	Source
Fixed line internet download speed *(country rank)*	99/179 (1 is best)	Ookla Global Index
Small businesses experiencing slow internet connectivity *(%)*	41%	Xero & World Wide Worx Technology Reshaping SA's Small Business
Mobile internet download speed (*country rank)*	54/138 (1 is best)	Ookla Global Index

Telco regulation

6 **Telecommunication regulation can play an important role in enabling competitive ICT markets and affordable electronic communication services. There is a large and stagnant gap** in telecommunication regulation. There are a number of regulatory bottlenecks and competition issues that are hindering affordable access to electronic communication services: firstly, a lack of spectrum and cost-based facilities access is driving high mobile service provision costs; secondly competition could be improved - particularly in the case of mobile markets - by regulating wholesale access. There have been a number of indications that the sector regulator is seeking to address the identified regulatory bottlenecks, however past experience and current regulatory and policy uncertainty suggests that change is unlikely to be forthcoming**.**

Telco regulation was analysed by an expert team of competition economists experienced in telco regulation and relies both on nuanced insight and interpretation of regulation.

Affordability

7 **Mobile data, even in small packages, should be affordable across income groups.** There is a **large and stagnant gap** in the affordability of mobile data. Data prices are 134% higher than BRICS nations and the most expensive across 13 African comparators[1314]. Declines in prices have flattened with South Africa's cheapest prepaid mobile 1GB still 166% more expensive than the second highest priced African comparator, Nigeria. This has disproportionate effects on low income consumers who are charged higher rates per MB when buying smaller bundles and businesses that are forced to rely on mobile networks which

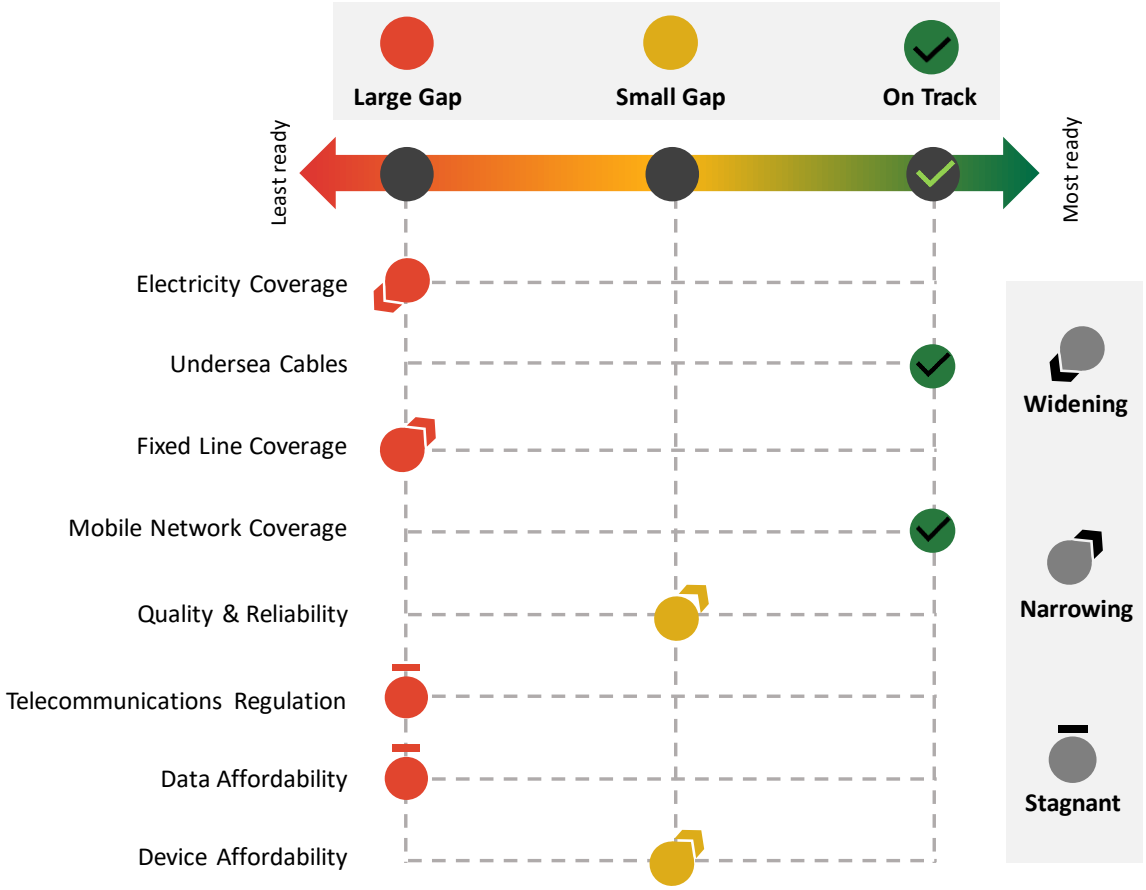
are almost twice as costly per GB as ADSL networks[15]. While MNOs are facing increasing scrutiny and pressure, data prices continue to be buoyed by market structure and the existence of a large captive consumer market without access to an alternative.

Select Measurements from Appendix	Score	Source
ICT Affordability Index (*country rank)*	74/178 (1 is best)	WEF Global IT Report
Cost of 1GB Bundle basket (*country rank – African Comparators)*	1/14 (1 is worst)	RIA After Access Survey
Share individuals reporting cost as primary barrier to internet usage (*%)*	15%	RIA After Access Survey

8 **The cost of hardware and devices must be accessible to South Africans across income groups**. There is a **small and narrowing gap** in this measure. Mobile devices are the most common means of accessing the internet at 72% of internet users[16]. High device costs are therefore a direct impediment to access. These costs have fallen approximately 41% since 2012[17]. Smartphones are often needed to access digital platforms. While simple smartphones are largely affordable at approximately R250, these may lack the functionality needed to access digital opportunities through apps. Smartphone ownership is rising, with 54% of the urban population owning smartphones versus 33% of those in rural areas[18]. The total remains short of OECD averages of 70% to 80%[19]. Device affordability should improve through time as innovation reduces production costs and focus in distribution moves away from branding.

Select Measurements from Appendix	Score	Source
Share of individuals using mobile phone as primary source of internet access (*%*)	72%	RIA After Access Survey
Share individuals reporting device access as primary barrier to internet usage (*%)*	36%	RIA After Access Survey
Smartphone ownership (*%, rural*)	33%	RIA After Access Survey
Smartphone ownership (*%, urban*)	54%	RIA After Access Survey

Summary of gap analysis



Universal Digital Access and Inclusivity

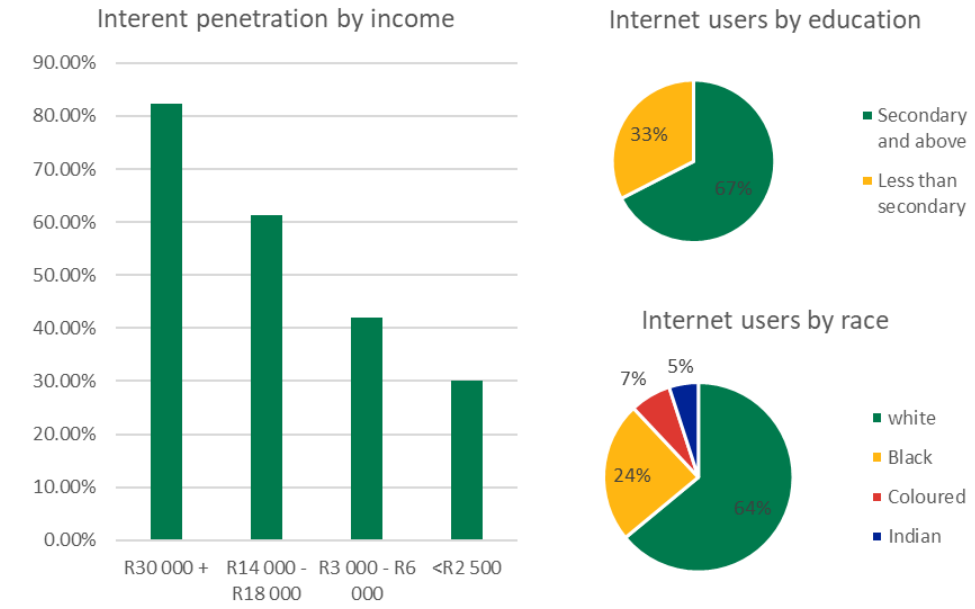
The universal digital access pillar directly affects the inclusivity of opportunity for workers, business and consumers by directly facilitating access to the digital economy. Digital access allows lower-skill individuals and those in the informal sector to search for and access new opportunities. For consumers it provides access to cheaper and higher quality goods and services that might have previously been enjoyed by a narrow set of wealthier individuals. Rural businesses may access markets previously serviced by urban businesses while emerging businesses are provided with a way of accessing similar scales of consumers as established businesses.

The pillar has a wide range of indirect effects and is core to enabling the mechanisms for inclusivity in three other pillars. For the human capital pillar, universal digital access provides a broader range of individuals with a means to access digital educational content which could be used to either supplement traditional education or serve as a substitute for traditional educational pathways. Affordability of digital connectivity can determine access to educational pathways as high costs would exclude lower income individuals. For the innovative business pillar, it provides businesses of all sizes and maturities with the means to create new forms of digitally-enabled business models, the opportunity to leverage digital goods and services as inputs, and to cooperate with other businesses regardless of geography.

Extending high quality and affordable access outside of metropolitan areas furthermore impacts the government pillar by improving the operating environment for local businesses and expanding individual access to opportunities that are not geographically bound. Fixed line penetration provides local government with the means of providing public WiFi access as a cost-effective alternative to mobile networks.

Although access to digital networks and the internet has been improving, internet usage is unequally spread and lacklustre among uneducated and low-income individuals. The gap between the connected and unconnected leads to disparities in access to opportunity. This 'digital inequality' is widening and compounded by differences in the financial resources and skills needed to use the internet optimally. [57] Approximately 31% of South Africans are active internet users and 30% active mobile internet users. Figure 1 illustrates how access varies by race, income and education.

Figure 1: Internet Usage in South Africa



Source: World Wide Worx, Magooze & After Access

The distribution of internet usage by race is severely skewed due to differences in earnings between racial groups. On average, the vast majority of internet users are white, with far inferior levels of access for the black, coloured and Indian populations at 24%, 7% and 5% respectively[58]. These figures are worrying given the socio-economic context of South Africa - only 7.8% of the population are white while 80.9% are black[59]. This is highly correlated with income - on average, the white population earns nearly 5 times as much as the black population. These results correlate with lower levels of internet penetration at lower levels

[57] RIA. (2017). The State of ICT in South Africa
[58] Online Media (2014) - *Internet Usage in South Africa* – Magooze
[59] StatsSA (2017). Mid-year population estimates.

of income, leading to the majority of those excluded from the internet being low-income earners.[60]

A geographic view shows that a digital divide exists between major metros and non-metro areas and between different cities and provinces. Internet penetration in the Western Cape is highest at 75%, followed by Gauteng at 55%[61]. Internet usage in urban areas exceeds rural usage by a relatively small gap of 8%[62] which evidences the role access to mobile technologies have in servicing non-urban communities. This has allowed rural communities to access services that were previously inaccessible by overcoming the limitations of the fixed-line market which faces high installation costs in rural areas where communities are dispersed or have low density populations.

There are three notable areas in the Digital Access gap analysis that create barriers to inclusivity. Analysis of the pillar suggests that access to the digital world is improving for individuals and businesses. However there are barriers that disproportionately affect select communities. Firstly, electricity access is skewed towards urban centres while those without access are primarily lower income individuals. The cost of data remains a significant barrier for low-income individuals who are left with no alternative to purchasing expensive, smaller bundles. As a result, internet penetration is far higher for the previously advantaged white community and falls drastically with income. While access to digital labour and product markets is theoretically available for lower income people, these costs may deter complete and effective participation. Concentration of fixed line connections in wealthy, metropolitan areas disadvantages businesses outside of these locales as they are forced to rely on higher cost, lower stability mobile connections. These businesses are not afforded the same opportunity to compete in digital markets as their urban counterparts.

[1] World Bank (2018)
[2] WEF (2018). Global Competitiveness Index
[3] Omarjee (2019) – *Eskom gets R69bn in financial support over 3 years* – Online Media - Fin24
[4] WEF (2018). Global IT Report
[5] ITU (2019). Fixed Broadband Access data
[6] RIA. (2017). The State of ICT in South Africa
[7] RIA. (2017). The State of ICT in South Africa
[8] WEF (2017). Global IT Report
[9] ICASA (2018). 3rd Report on the State of the ICT Sector in South Africa
[10] Ookla (2019). Speedtest Global Index
[11] Xerox & World Wide Worx (2018) - How technology is reshaping South Africa's small business economy
[12] Ookla (2019). Speedtest Global Index
[13] RIA. (2017). The State of ICT in South Africa
[14] Seeth (2018) - *High Data Costs Challenged – Low Income Households Hit the Hardest* – Online Media - CityPress
[15] MyBroadband, (2018) - *MWEB to charge R49 for 1GB of ADSL data* – Online Media - MyBroadband,
[16] RIA. (2017). The State of ICT in South Africa
[17] GSMA (2018) The Mobile Economy – Sub-Saharan Africa
[18] RIA. (2017). The State of ICT in South Africa
[19] RIA. (2017). The State of ICT in South Africa

[60] RIA. (2017). The State of ICT in South Africa
[61] World Wide Worx. (2017). Internet Access in South Africa
[62] Siemens. (2017). Digitalization maturity report.

Human Capital

South Africa's education ecosystem will have to supply a steady pipeline of candidates with skills that allow them to develop, utilize and complement technology in order for digital economic opportunities to scale. The specific skills required range by opportunity – some are technology skills while others simply relate to digital literacy or the ability to work digitally. The Human Capital pillar considers these skill requirements, and the resulting demand on educational institutions, in terms of foundations (throughput from basic and secondary into tertiary education), tertiary education pathways, attracting and retaining critical skills, and organised labour in the digital age. These are the key areas measured in this pillar.

Creating a steady supply of quality digital skills will require outputs at each stage of the education process, including the quality of foundational systems and the throughput into tertiary education. Basic and secondary education requires both high quality teaching of STEM subjects and a high throughput of students matriculating with these subjects. It also requires a strong pipeline of raw talent with the financial means to access tertiary education pathways.

The quality and output of tertiary education pathways, particularly STEM graduates, will need to be scaled. This requires an improvement in traditional tertiary institutional capacity, such as universities and TVETs, to supply both STEM degree graduates and more specialized degrees in specific frontier technologies such as, AI, data analytics and robotics. Furthermore, traditional tertiary institutions need to be flexible enough to adapt to further, rapid developments in tech innovation, keeping curriculum design up to date with the pace of innovation and responsive to the needs of local industry.

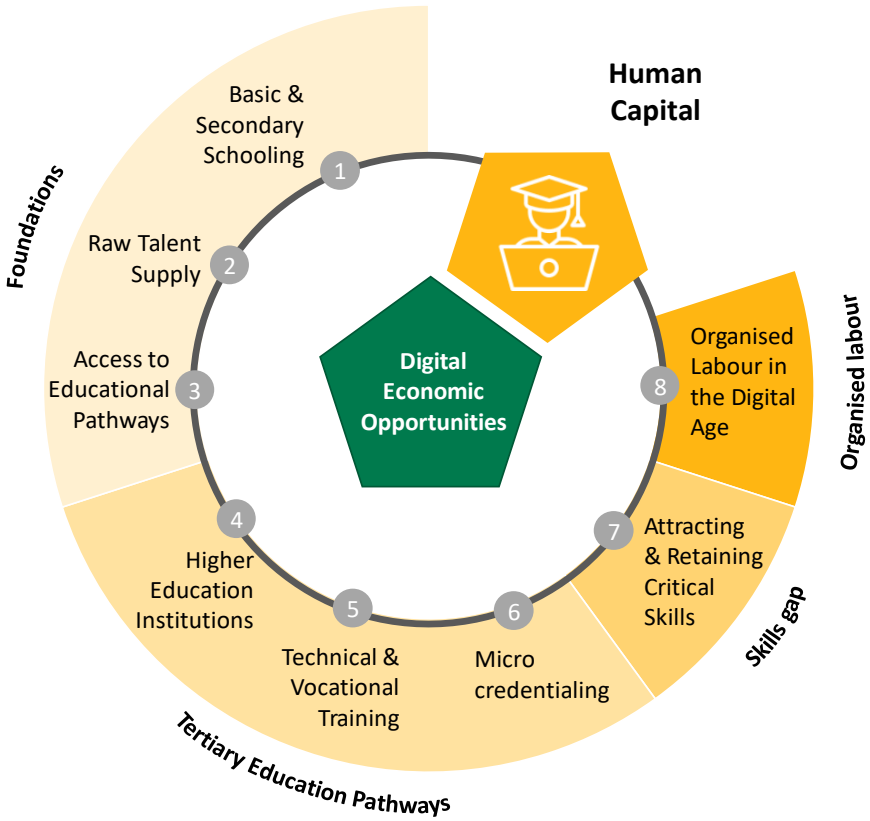
In addition to traditional tertiary institutions, the scale and diversity of tech skills are such that universities alone may be unable to meet demand. There are already a number of alternative education providers - some of which provide training online - that are emerging to provide training in niche tech skill areas, or for more generalizable tech skills that do not require tertiary qualifications such as coding. Supporting the emergence of these alternative providers, for example through flexible accreditation standards, will be important for the skills supply chain in South Africa to scale.

All opportunities will benefit from strategies that retain and attract critical skills and close the critical skills gap. This can include processes supported by migration policy that reflects the demand for specific opportunities, and strategies that seek to prevent emigration of local skills.

Labour requires effective representation and the opportunity to co-create a common vision of inclusive national objectives alongside business and government. Processes underpinning the digital age are transforming production system and the role of organised labour. Labour

unions are designed to represent the interests of their members and may come to reflect their members' anxiety in an uncertain future. A co-created vision among stakeholders may allay fears and align incentives. Forward-looking labour unions that conceptualise strategies which help labour transition and adapt to new forms of work could improve the effectiveness of technology adoption and offset some of the risks for labour.

The specific readiness conditions to be measured are listed in the diagram below, and a summary of the measurement for each condition follows thereafter. The full detail of the condition measurement is available in Appendix II.



Foundations

Basic and secondary schooling is necessary to ensure the South African population can pursue higher education and gain more complex digital skills. There is a **large and stagnant gap** in this measure. As of 2016, 16% of children aged 5-14 were not enrolled in any form of basic or secondary schooling, leading to South Africa ranking last amongst 43 OECD partner countries.[20] Worryingly, only 30% of students who enrol in grade one actually make it to and pass matric[21]. The shortfalls of inadequate enrolment are compounded by poor educational outcomes across both basic and secondary schools: as of 2016, 78% of grade 4 learners were classified as illiterate by The Progress in International Reading Literacy Study; and in 47% of high schools, no pupil performed at the intermediate international mathematics benchmark.[22]

Select Measurements from Appendix	Score	Source
Schooling enrolment, 5-14 years *(% of population)*	84%	OECD
Students completing Gr. 9 after completing Gr. 3 *(%)*:		
White	98%	StatsSA Education Series
Coloured	87%	
Indian	97%	
Black	54%	
Student dropout during Gr. 11 & Gr 12 *(%)*:		
Male	29%	StatsSA Education Series
Female	13%	
Population 25-64 with no attainment beyond Gr. 7 (%)	19%	StatsSA Education Series
Grade 4 student achievement in reading *(country rank)*	50/50 (1 is best)	PIRLS Literacy Study
Grade 4 student achievement in maths *(country rank)*	48/49 (1 is best)	TIMS-N Maths Study
Perceived quality of science and maths education *(country rank)*	128/137 (1 is best)	WEF Global Competitiveness Report
Matric candidates qualifying for university *(%)*	29%	StatsSA
Private Institution attendance *(% of students)*	10%	StatsSA
Private Institution matric pass rate *(% of students)*	98%	Online Reporting

2 **A supply of raw talent ensures there is a large input to tertiary educational pathways that can be leveraged to unlock current and future economic opportunities**. Raw talent is **on track.** With approximately 10.3 million youth either unemployed or enrolled in educational institutions, there is a large pool of raw talent that can be leveraged to scale the supply of skills necessary for leveraging economic opportunity.[23,24,25] The Oxford School of Economics consider South Africa among the 10 countries expected to produce the largest skills supply by 2021.[26] Whereas nations such as Japan and Canada suffer from an aging population, South Africa is unlikely to be in shortage of raw talent and is at a demographic advantage.

Select Measurements from Appendix	Score	Source
Students in public, private, TVET and CET *(no.)*	2.3 million	DHET
Students in SETA programs *(no.)*	249,000	DHET
Youth not in employment, education or training *(no.)*	7.8 million	DHET
Strongest talent surplus *(county rank)*	4/46 (1 is best)	Oxford Global Talent Rank

3 **Translating this raw talent pool into tertiary education pathways requires barriers to access being addressed.** There is a **large though narrowing gap** in this measure. There are significant financial barriers for students seeking to enter educational pathways with HEI costs rising at an average of 2% above inflation between 2008 and 2015 and nearly 51% of youth aged 18 to 24 not having the funds to pay their tuition.[27,28] However, there has been significant progress in increasing access, with government committing to increase its contribution to HEIs by R17.6 billion over three years from 2016 and adjusting the criteria for students that qualify for NSFAS grants – improving access for lower income individuals and a driver of economic inclusivity.

Select Measurements from Appendix	Score	Source
Annual tertiary education fee growth ('08 –'15) *(%)*	8.8%	StatsSA
'No money for fees' as reason for not attending educational institution *(%)*:		
Total	51%	StatsSA
White	28%	
Not-white	53%	
NSFAS rejection rates *(% of applicants)*	25%	NSFAS

TVET students supported by NSFAS *(no.)*	255,557	NSFAS
Government spending on tertiary institutions as % of GDP *(country rank)*	62/94 (1 is highest)	UNESCO

Tertiary education pathways

Higher Education Institutions (HEIs) need to be accessible and produce high quality expertise relevant to the digital age. Higher education institutions in South Africa have **a small and stagnant gap**. South Africa has a traditional strength in the quality of its universities - in the Times Higher Education (THE) World Universities Rankings in 2019, four of the top five universities in Africa are South African.[29] These institutions are producing a range of expertise with a rising output of STEM degrees at 29.1% of all graduates.[30] However, access remains constrained to 10% of youth, while there is evidence of poor performance and failure rates.[3132] In addition, these institutions are institutionally rigid leading to curricula that is outdated and does not accurately reflect the requirements of business.[33]

Select Measurements from Appendix	Score	Source
Ranking of top South African University *(rank)*	156/1250 (1 is best)	Times Higher Education
Ranking of top South African University *(rank)*	241/2500 (1 is best)	URAP
Increased likelihood of employment holding university qualification over matric *(%)*	36%	Hofmeyr *et. Al*
Share of graduates in STEM *(country ranking)*	60/93 (1 is most)	UNESCO
Share of youth in university *(%)*	10.3%	DHET; StatsSA
Student enrolment in HEI *(no. of students)*	1,200,000	DHET
Course success rates *(% of students)*	78%	CHE

Technical and vocational educational training (TVET) programs need to provide practical and relevant qualifications and training at scale. The TVET system in South Africa suffers from a **large and stagnant** readiness gap. Studies into the sector suggest that TVET programs have significant curriculum challenges and are not adequately preparing students for work – curriculums are largely out-dated, lecturers are often out of touch with industry or have no industry experience whatsoever while programs are infrequently paired with practical experience.[34] This is a significant impediment as students with practical experience have 82% better odds of findings work.[35] Negative perceptions of the quality of these qualifications by both the private sector and other educational pathways create barriers to employment and accessing HEIs.[36] This disadvantages TVET graduates who may come from largely lower income backgrounds given the greater availability of subsidy and lower financial barriers to access. While a ministerial task-team has been established to oversee the overhaul of the system, this is yet to be embarked upon.

Select Measurements from Appendix	Score	Source
Student enrolment in TVET colleges *(no. of students)*	705,000	DHET
TVET completion rate – Report 191 (N6) *(%)*	64.8%	Stats SA
TVET assessment combines expert insights from research conducted by the Council on Higher Education and interviews with key stakeholders along the TVET value chain.		

6 **Micro credentialing institutions can support significant skills scaling as they offer a means of accelerated, practical and demand driven learning.** There is a **large and stagnant gap** in this measure. Micro-credentialing institutions are considered the most flexible and demand driven with some being sector specific and others being open content providers. Many micro-credentialing institutions are not recognised under the national qualification framework (NQF) or Sector Education & Training Authority (SETA) accreditation framework.[37] It appears that there is no clear plan to integrate emerging micro-credentialing programmes into the SETA accreditation standards. Without this accreditation, businesses find it difficult to access SETA funding to scale training partnerships with these micro-credentialing institutions.[38] This places the acceptance of these programs in South Africa behind global trends.

Conclusions are drawn from interviews with key stakeholders from micro-credentialing institutions and published academic articles. The conclusion and ranking is derived from an interpretation and synthesis of available information.

Skills gap

7 **Creating an attractive environment that retains critical skills and prevents widening of the critical skills gap can aid in scaling the skills supply.** There is a **large and stagnant gap** in the country's ability to retain and attract critical skills. Mismatches in labour have created a critical skills gap that will be challenging to close in the short term. The skills gap is significant with 76% of businesses finding the recruitment of critical skills a challenge.[39] This gap is at risk of widening as 50% of a select sample of to-be graduates plan to work overseas while established professionals seek new opportunity abroad.[40] The 'brain drain' is extensive with South Africa ranking 75 of 125 countries in ability to retain talent.[41] In response, business has come to partially rely on foreign talent which may crowd out local job seekers. South Africa's attractiveness to foreign talent is depressed by poor local conditions and an antiquated and ineffective migration policy.[4243] Whereas Vietnam, India and China are actively seeking to recruit people from their diasporas, strategies that create incentives for South Africa expatriates and graduates to return home from overseas are not in place. Business is furthermore exploring flexible work arrangements as a solution to the skills gap.

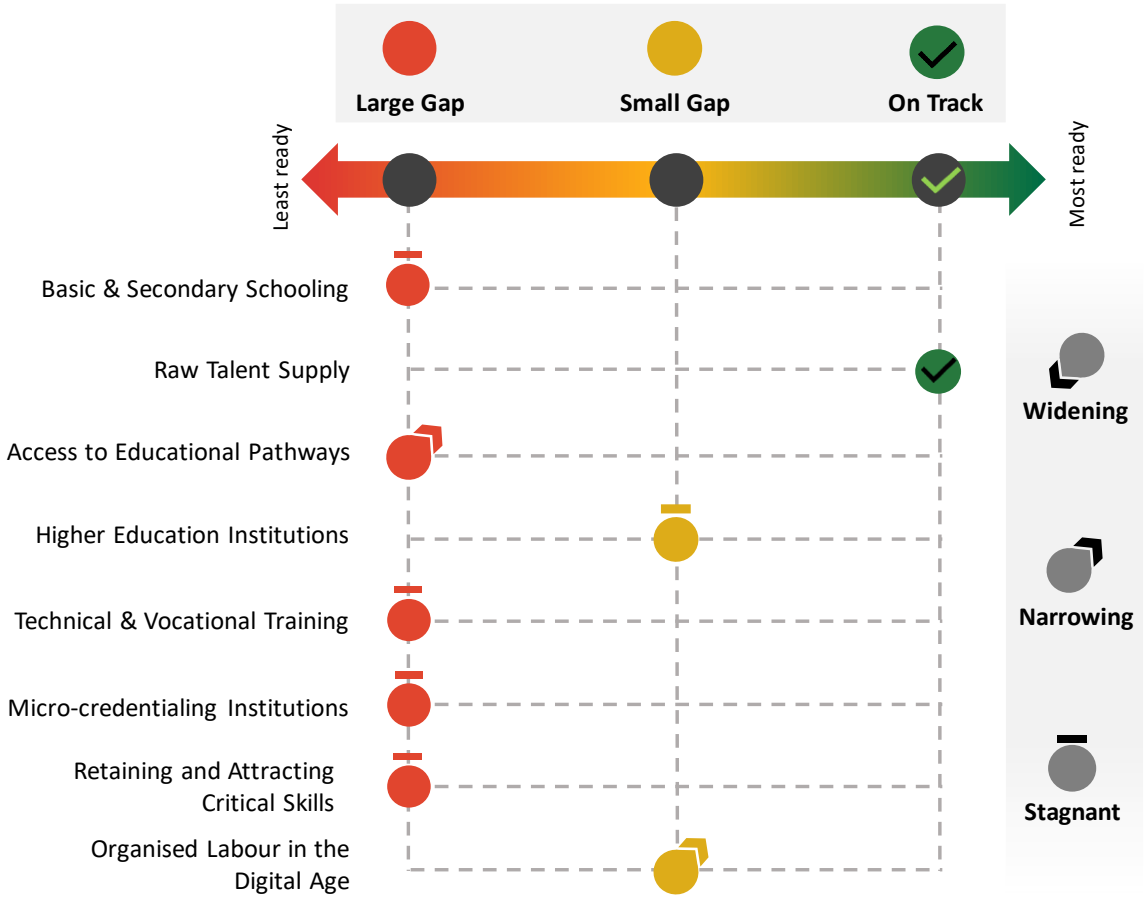
Select Measurements from Appendix	Score	Source
Extent to which companies find people with the skills needed to fill vacancies *(country rank)*	77/140 (1 is best)	WEF Global Competitiveness Index
Share of business experiencing difficulty recruiting critically skilled staff *(%)*	77%	XPatWeb
Share of business confident international search would assist in closing skills gap *(%)*	76%	XPatWeb
Share of professionals emigrated (1989 – 2003) *(%)*	7%	DHA
Ratio of skilled emigrants to immigrants (1989 – 2003)	8.2	Stats SA
Anticipated net-loss of skilled labour in South Africa given global freedom to immigrate *(%)*	16%	Gallup World Poll
Country retention of talented skills *(country rank)*	78/137 (1 is best)	WEF Global Competitiveness Index
To-be university graduate intention to work overseas following graduation *(%)*	54%	PPS Student Confidence Index

Organised labour

South African labour requires representation from unions that can effectively guard their rights and develop strategies that enable labour to leverage the opportunities and mitigate the risk of the digital age. South Africa has a **small and closing measure** relating to organised labour in the digital age. South Africa has a rich history of organised labour with membership comparable to BRICS counterparts and far above OECD averages[44]. While membership has deteriorated since the late 90s, unions remain key in the guardianship of labour rights - nearly 25% of salary increments were negotiated by unions alongside employers in 2015.[45] Unfortunately, labour-business relations are poor and often antagonistic. The attitudes of unions towards digitisation are split between those that consider them an opportunity and those that consider them a threat. On the positive end of the spectrum, labour unions are defining the strategic imperatives needed to guard the wellbeing of labour in the digital age.[46] This has led to instances of unions embracing digitisation of production processes alongside strategies of skills development. Select unions consider digitisation a process of disempowerment.

Select Measurements from Appendix	Score	Source
Cooperation in labour-employer relations *(country rank)*	137/137 (1 is best)	WEF Global Competitiveness Index
Union Membership *(% of employed, 1997)*	45.2%	Institute of Race Relations
Union Membership *(% of employed, 2018)*	29.4%	Stats SA
OECD Average Union Membership *(%)*	30.2%	OECD
BRICS Average Union Membership *(%)*	40.4%	Bond, P. Wits University
Share of annual salary increments negotiated by employer and union *(%)*	22.4%	Stats SA

Summary of gap analysis



Human Capital and Inclusivity

The human capital pillar has important direct effects on inclusivity by determining which individuals can access opportunities, and which businesses can access skills. Access to foundational schooling and higher educational pathways is fundamental as it can broaden the pool of people who can create new opportunities and who can access new opportunities that require a baseline of skills. A well-functioning educational ecosystem is a key means of directly addressing disparities in human capital created by historically institutionalised inequalities. Financial barriers to educational pathways means lower income individuals are less able to access economic opportunities requiring trained skills, while traditional educational systems that require on-site attendance create barriers for prospective students who are not within reach of a physical institution. These geographic barriers have secondary effects as proximate institutions may not be of the highest quality. This impacts the likelihood of success for workers seeking to enter the job market and workers' abilities to remain relevant in a digital workplace.

The pillar has a wide range of indirect effects on inclusivity through its impact on three other pillars. Firstly, human capital complements the entrepreneurial activity enablers detailed in the innovative business pillar by strengthening the capacity of entrepreneurs, who themselves are key sources of opportunity for others. Established businesses are furthermore

presented with domestic talent and can avoid reliance on foreign talent and avoid crowding out local opportunity seekers. In the case of universal digital access, a baseline of human capital in reading and writing enables an individual to access and digest digital content effectively. Finally, the human capital pillar impacts the government support pillar by informing the geo-spatial distribution of skills and abilities of individuals to participate in the digital economy. This has an important impact on the conditions around which spatial development policy and strategy are designed.

Access to and performance in primary and secondary schools remains racially skewed. Lower quality education in the majority of public and rural schools place individuals with lower incomes or living outside of metros at a disadvantage. Of the top performing 200 schools, 185 are former white only schools which are better resourced and concentrated in urban and peri-urban locations[47]. These schools tend to charge significant fees that create barriers to previously disadvantaged communities[48]. Inequality in access to performing institutions translates into inequality in student performance – 84% of Grade 5 learners who attend independent schools understand mathematics at international benchmarks in contrast to 67% in public schools charging fees and 25% in fee-free schools[49]. This incurs discrepancies along racial lines with 85% of white learners in contrast to 48% of black learners meeting these benchmarks. This creates imbalances in access to tertiary education - independent schools have a bachelor pass rate of 51.3% while public schools have a rate of 37.6%[50].

Racial inequalities in access to and performance in post-school institutions mirror those of primary and secondary schooling. Whereas nearly 35% of white youth aged 18 to 24 are attending post-school institutions, only 10.2% black Africans are able to attend[51]. Financial barriers are partly responsible with 53% of black African youth citing a lack of finance as the reason for not attending post-school – above the national average of 51% and the 28% average of white youth.[52] While financial barriers to HEIs are being reduced, they remain significant leaving a large stream of youth attending underperforming TVETs. This too is racially skewed – while nearly 72% of public HEI students are black African and 15.5% white, 92% of TVET students are black African and 1% white[53]. Previously disadvantages groups continue to have lower graduation rates and are less likely to study post-graduate degrees.[54]

Educational inequalities along racial, income and geographic lines translate into imbalances in accessing emerging and traditional work opportunities. This inequality in the South African education ecosystem is a strong cause of economic inequality due to the impact it has on employment and earnings[55]. Those with access to and success in HEIs earn significantly more than their diploma or certificate holding counterparts. This process can create inter-generational effects – children of lower income families are more likely to have poorer educational outcomes, access to fewer work opportunities and thereby be constrained in their ability to provide quality educational opportunities for their own children.

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[34] DHE (2018) TVET Sub-Sector Report for the 2019/2020 Sector Skills Plan
[35] DHE (2018) TVET Sub-Sector Report for the 2019/2020 Sector Skills Plan
[36] Interviews with Stakeholders conducted by Genesis Analytics, February-March 2019.
[37] Makura & Nkonki (2017)-Constraints and enablers of articulation from further education and training colleges to Universities: Perceptions from South Africa
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[39] XPateWeb (2017). Critical Skills Survey
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[45] Stats SA (2016). QLFS
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[47] Vally (2019) – *Educational Inequality: The Dark Side of SA's Education System* – Online Media – Daily Vox
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[52] StatsSA (2017) Education Series Volume V – Higher Education and Skills in South Africa
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[54] DHET (2016) Statistics on Post School Education and Training in South Africa
[55] Online Media – *South Africa's Poor Education System Partly to Blame for low Economic Growth : IMF* – Business Tech, 2019

Government Support

Policymakers, regulators and other government agencies have a critical role to play in creating an enabling environment for digital economic opportunities to scale. This pillar considers five important roles government plays in this regard. First, ***government as the regulator of business*** assesses the relevance and effectiveness of competition policy for the digital age, the quality of guardianship of intellectual property and the enforcement of data regulation. Second, ***government as the manager of fiscal tools*** assesses South Africa's approach to taxing digital firms. ***Government as a bridge for accessing opportunity*** is the third role which measures local government's ability to expand economic opportunity beyond metros and enable local business to create employment opportunities. The final measure, ***government as a regulator of labour markets,*** assesses whether emerging forms of work are covered by labour regulation.

Disruptive business can create challenges for competition, intellectual property, and consumer data protection policy and regulation. Disruptive innovators can have drastic impacts on the distribution of market power in a very short period due to extreme returns to scale and network externalities which entrench early-adopting digital firms. Competition regulators are still determining how best to respond and adapt to these new forms of business to safeguard consumers. Intellectual property regulation balances consumer welfare against incentives for business innovation. Regulation should therefore consider the appropriate conditions under which this right is granted to ensure that digital platforms and frontier technology firms alike are motivated to innovate while avoiding any detrimental impact on consumers. Consumer data protection and cyber security policy aims to protect participants in the digital economy without being overly restrictive of business operations.

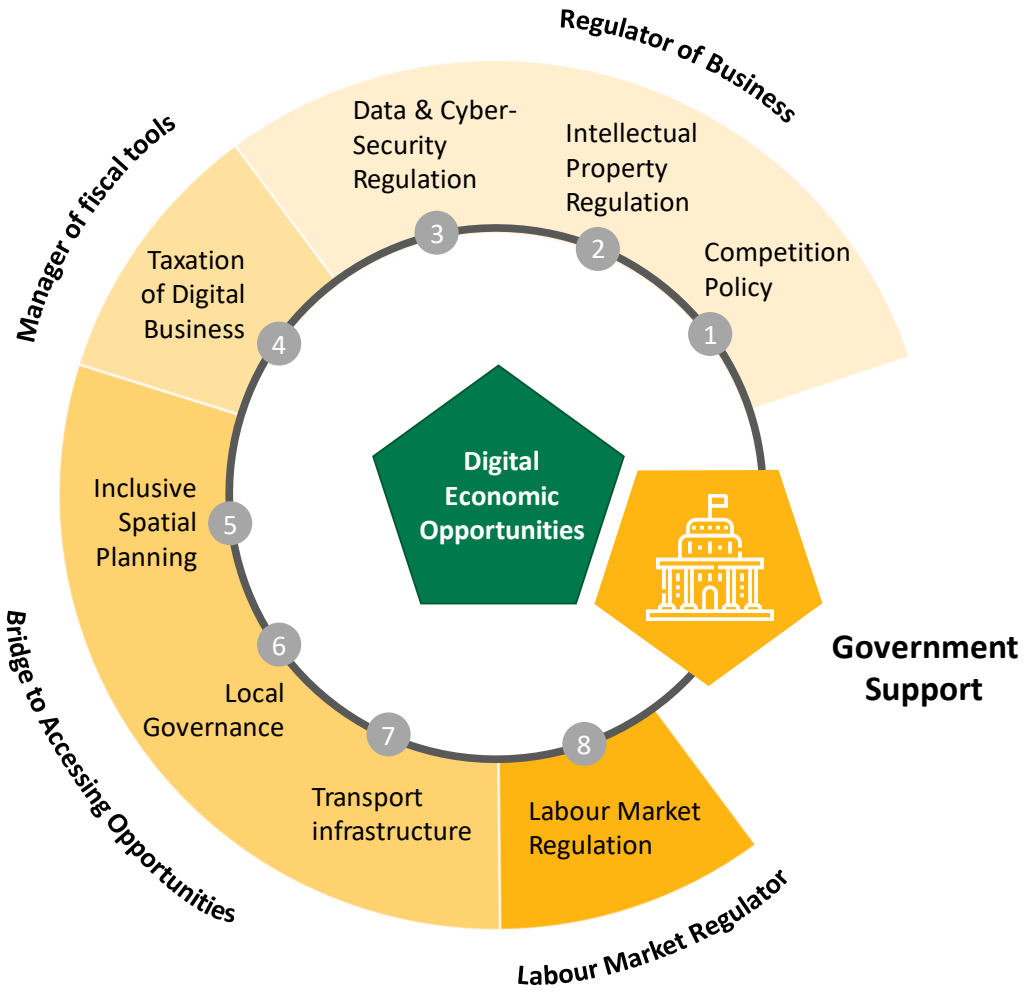
Digital firms and innovative disruptors are changing the way value is created and delivered which creates complexities for taxation policy and its execution. These entities develop innovative operating and ownership modes to offset their tax burden. For example, Uber is domiciled in San Francisco and all trip fares paid directly to a subsidiary in the Netherlands. Taxation policymakers are grappling with how to account for these complexities to ensure the rightful share of profits are taxed.

Local governance can play a critical role in providing a bridge for low-income earners to access economic opportunities. Individuals require transport infrastructure to move around both affordably and reliably to access economic opportunity located far away from where they reside. City and municipality delivered transport infrastructure is a key lever in providing for this need. Improving the inclusivity of all opportunities requires they spread beyond large cities and urban areas. Policymakers are considering how digital economic opportunities can be spread beyond cities, as has been done in the tourism industry. Sectoral specific regulation and local government efficiency is instrumental in enabling or blocking the scaling of digital

opportunities. Low-skilled labour platforms are often reliant on city level regulation. For example, drivers on e-hailing apps are often required to acquire taxi permits which are administered by local government.

New forms of work are requiring new approaches to labour regulation to ensure that labour protection is appropriately extended to digital workers. Unlocking demand for low skilled labour and across flexible work platforms has also unlocked new forms of income-generating work. These challenge conventional views of employment, and the labour market regulation that governs fair pay and work conditions. South African regulators will have to consider how minimum and other wage regulations should apply to platform work in the gig economy. This choice determines which aspects of labour market regulation should apply to platform participants. These may include considerations of whether platform participants are exposed to a fair number of opportunities and whether issues of market concentration lead to a race to the bottom in fees. Regulators will furthermore have to determine how digital platform participants are able to bargain with platform developers and how unionisation should be engaged with.

The specific readiness conditions to be measured are listed in the diagram below, and a summary of the measurement for each condition follows thereafter. The full detail of the condition measurement is available in Appendix III.



Government as a regulator of business

1 **Competition policy will have to reflect the drastic impact digital firms and disruptors have on market competition and structure.** There is a **small and closing gap** in this measure. South African competition policy and its enforcement is of a high quality and has contributed to an environment that promotes innovation.[56] With the emergence of powerful digital firms and disruptors, OECD research advises competition commissions to play an increasingly active role by conducting more frequent market inquiries and shift the burden-of-proof onto digital incumbents who must demonstrate that their actions are pro-competitive - even in the absence of confirmed consumer welfare losses.[57] The Competition Amendment Bill strengthens the Competition Commission of South Africa's (CCSA) powers to conduct independent market inquiries and shifts the burden-of-proof to dominant firms that must demonstrate that pricing is not anti-competitive.

The assessment of this condition relies on interpretation of policy changes relative to emerging best practice. The quality and effect of South African competition policy and oversight draws from general sentiments and an innovative empirical study. A small set of indicators of the competition environment are available for international comparison, however these are aggregated indexes and open to interpretation.

2 **Businesses need to be confident that they have adequate rights to the returns of their innovation and that these rights are adequately enforced.** There is a **small and closing gap** in the measure of intellectual property (IP) rights. IP is perceived by business to be well protected in South Africa, ranking far above global averages and BRICS comparators.[58] South Africa's IP regulation is in the process of overhaul, replacing the 'depository' IP system with a 'substantive' system. The depository system is believed to undermine genuine innovation as patents are granted when meeting thin formal requirements and only ever examined if challenged in litigation.[59] This system provided market exclusivity regardless of patent quality. Input from UNCTAD and the UN has seen Phase 1 of the Intellectual Property Policy of RSA completed. This recommends transition to a substantive system that uses expert examiners to judge whether patent applications warrant the grant of IP. This system is used in innovative BRICS comparators such as China, India and Brazil.[60]

Select Measurements from Appendix	Score	Source
Perceived extent of intellectual property protection *(country rank)*	24/139 (1 is best)	WEF Global IT Report

Assessment of the condition relies on findings of expert researchers and analysis of the incentives and dynamics of IP systems to conclude the likely impacts of regulatory reforms. Conclusions are in accordance with the IP Unit (UCT). Empirical measurement of IP policy effectiveness has been noted by the IP Unit as challenging given data availability.

3 **Data and cyber-security regulation should protect consumers and meet international expectations without undue pressure on business.** This is a **small and closing gap** in this measure. The unenforced Protection of Personal Information Act (POPI) is generally on par with the international benchmark of the EU's General Data Protection Regulation (GDPR). There is a gap in enterprise readiness as many businesses require process and procedure overhauls, financing and expertise to comply - a survey of enterprise found that 8% will probably not be ready and 3% will definitely not be ready to comply.[61,62] While small, this gap

is paralleled by uncertainty regarding the government's likely effectiveness in enforcement. South Africa ranks 4th on the continent and 56th of 156 countries in the ITU cyber-security index.[63] South Africa's cyber-security regulatory framework is in the process of overhaul, however impending legislation prioritises punitive measures without enforcing preventative action.

Select Measurements from Appendix	Score	Source
Cyber-security composite index *(county rank)*	56/156 (1 is best)	ITU
POPI level of priority for organisation *(%)*:		
High	62.3%	Sophos POPI Survey
Low	21.4%	
Organisation readiness for POPI compliance *(%)*:		
Will definitely be ready	34%	Sophos POPI Survey
Will probably be ready	33.3%	
Unknown	11.3%	
Already Compliant	10.7%	
Probably not be ready	8.2%	
Will definitely not be ready	3.5%	
SMME POPI Compliance *(%)*:		
Compliant	16.35%	Botha *et. Al.*
Non-compliant	16.35%	
In the process of complying	11.54%	
Unknown	55.77%	

Government as a manager of fiscal tools

5 **Taxation policy will have to provide the means to tax digital firms which often have complex operating and ownership models.** There is a **large and closing gap** in this measure. The general effectiveness of the South African Revenue Service has been called into question given the loss of expertise, closure of various investigative divisions and poor management under the former SARS commissioner. Despite these shortfalls, taxation policy is at least partially adapting to the peculiarities of digital firms with the existence of a digital tax - multi-nationals providing e-services in South Africa with operations domiciled overseas are required to register with SARS and pay 15% of revenues in VAT. Foreign digital firms operating in South Africa are however not subject to any form of corporate tax. The Davis Tax Committee has advised South Africa follow the lead of regulation developed in the OECD in this regard.[64] Taxation of robots that replace labour has drawn little attention locally.

This evaluation of readiness to tax digital firms overlays current policy changes with global trends and best practices. Given the susceptibility of the tax base to economic conditions, traditional metrics focusing on collection targets are inappropriate for measuring the effectiveness of SARS.

Government as a bridge for accessing opportunities

8 **Local government can play a role in enabling inclusive spatial development and encouraging economic opportunity outside of urban enclaves**. There is **a large and closing gap** in this measure. South Africa has a large spatial development gap with economic activity concentrated in less accessible city centres which disadvantages rural populations. Between

1996 and 2012 job growth was twice as fast in metros and accounted for 74.9% of all new jobs[65]. While this is indicative of a general trend of urbanisation, managing this trend so that the gains from economic opportunity are more equitably distributed is important. South Africa has a relatively comprehensive and up to date spatial planning policy framework including the NDP, Integrated Urban Development Framework and Spatial Planning and Land Use Management Act. The effectiveness and local government execution of these policies are hampered by poor coordination, staff skills and complex and confusing burden sharing policies.[66] There are however instance of success as with the emergence of government-led tech innovation hubs being located in townships.

Region	**Highest Educational Attainment – Secondary School** *(%) (2001 – 2016)*	**Employed** *(%) (2001 – 2016)*	**Source**
Gauteng metros	27.7% - 35.5%	45.0% - 48.3%	Turok, Scheba & Visagie
Coastal metros	24.6% - 34.4%	40.7% - 46.6%	
Secondary Cities	21.4% - 30.6%	37.0% - 41.9%	
Commercial Farming	15.6% - 23.3%	38.1% - 41.2%	
Most former Bantustan	10.7% - 17.1%	16.2% - 26.0%	
Region	**Households with Piped Water** *(%) (2011)*	**GDP Capita** *('000 ZAR) (2016)*	**Source**
Gauteng & Cape Town	89.0%	70.0	Arndt, Davies & Thurlow
Other Metros	82.0%	64.5	
Secondary Cities	84.1%	61.2	
Large Towns	71.3%	45.1	
Small Towns	75.9%	38.9	
Rural Areas	37.5%	17.0	

The persistent disparities in economic performance between regions are available from a host of public sources. However, disparities are not solely a function of policy and reflect underlying economic capabilities and comparative advantages. The assessment recognises this and complements these figures with a review of policy, and research conducted by government and academia on institutional local government challenges and barriers to execution of policy.

9 **Local government regulation can support digital businesses to scale efficiently and expand employment opportunity**. There is a **large and stagnant gap** in this measure. Local governments have not been particularly effective at enabling business operation or establishing strong public-private relationships. An IUDF assessment observed that many municipalities do not meaningfully engage with local business or other economic stakeholders.[67] Moreover, some municipalities have an adversarial relationship with business as they do not pay suppliers on time or at all[68]. The Cities Support Program (CSP) seeks to unlock growth in cities and create positive business environments and was formulated in consultation with the World Bank and with recognized industry experts embedded in business. This indicate that government is investing in and committed to improving government-business interaction and local government responsiveness. This program is yet to move from planning to implementation.

City Ranked	Getting electricity *(1 is best)*	Dealing with Construction Permits *(1 is best)*	Source
Buffalo City	5/9	6/9	World Bank Doing Business
Cape Town	1/9	1/9	
Ekurhuleni	6/9	4/9	
eThekwini	2/9	2/9	
Johannesburg	3/9	8/9	
Mangaung	4/9	7/9	
Msunduzi	8/9	3/9	
Nelson Mandela Bay	9/9	5/9	
Tshwane	7/9	9/9	
South Africa *(country rank)*	109/190	96/190	World Bank Doing Business
Variation in local government capability is proxied through measures from the World Bank Doing Business Report with conclusions as to business-local government engagement validated against observer opinion and government-led research.			

10 Government can help support the economic mobility of people and reduce the burden of transport costs through efficient public transport networks. There is a **large and stagnant gap** in the availability and affordability of transport in South Africa. The Department of Transportation defines transportation as affordable when a household spends less than 10% of its income on transport costs.[69] More than 50% of poor households in South Africa spend over 20% of their income on public transport while some households spend up to 43%.[70,71] Households in rural areas tend to allocate more to public transport than those in urban. With approximately 20% of South Africans having access to private vehicles, the bulk are reliant on public transport networks[72]. Public transport incurs 0% VAT and attracts government subsidies, but these seem to be ineffectively targeted. The public transport network furthermore falls short of necessary capacity, is unreliable and inaccessible for the vast majority.[73,74,75,76] Select local governments have strategies to deal with this challenge, but these are yet to translate into progress.

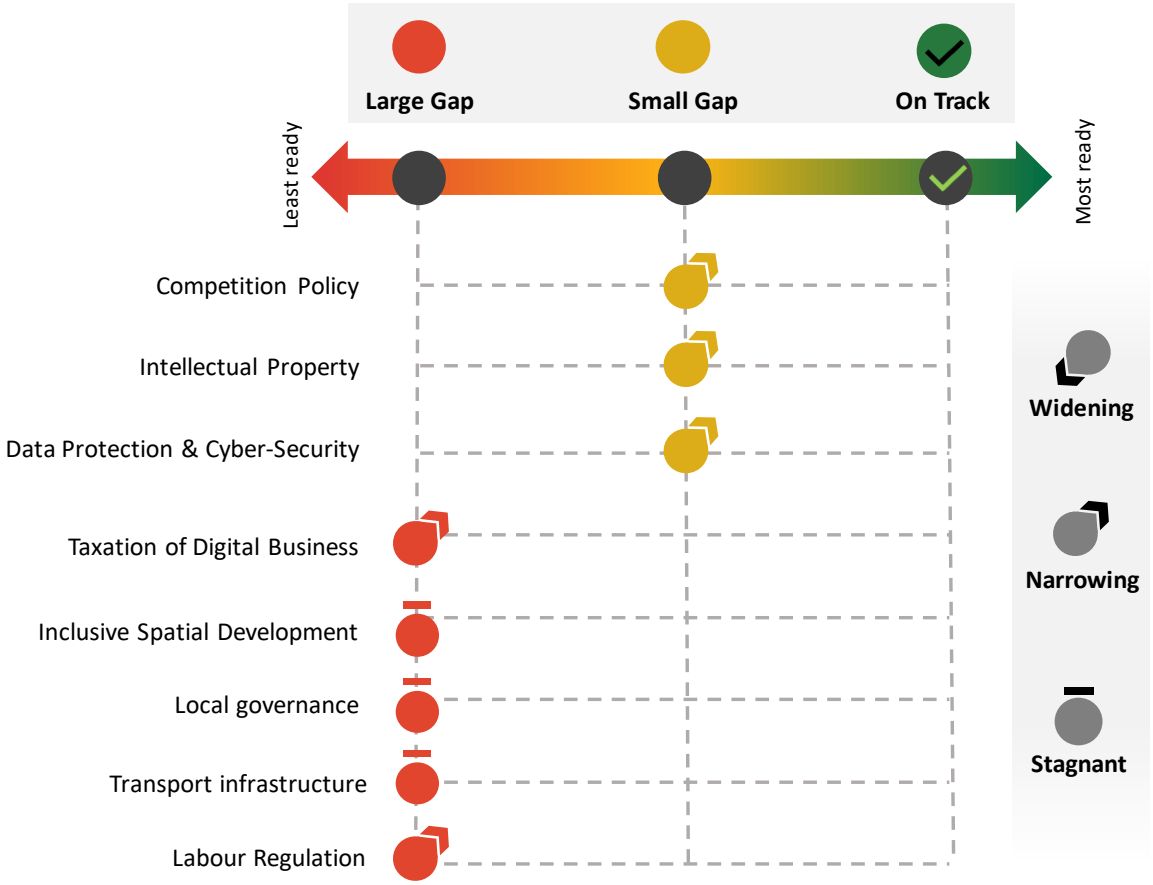
Select Measurements from Appendix	Score	Source
Main mode of transport used by households *(%):*		Stats SA Household Expenditure on Public Transport Research
Car/bakkie	21%	
Walk or other	2.3%	
Public - Train	7.6%	
Public – Bus	18.1%	
Public - Taxi	51%	
Households spending more than 20% of income on public transport by income quintile *(%)*:		Stats SA Measuring Household Expenditure on Public Transport.
Highest Quintile	2.9%	
Quintile 4	15.6%	
Quintile 3	29.4%	
Quintile 2	41.9%	
Lowest Quintile	66.6%	
Share of household income spent on transport for transport to be defined as affordable (%)	<20%	Victoria Policy Institute
	<10%	DoT
Public Transport safety and integration *(index)*	2/5 (5 is best)	Deloitte City Mobility Index

Government as a regulator of labour markets

11 **Labour market regulation should be dynamic and provide adequate rights to emerging and non-traditional forms of labour.** There is a **large but closing gap** in labour market regulation**.** Impending and established labour market legislation such as the national Minimum Wages Act, R204, and the Labour Regulations Act all demonstrate the capacity for labour regulation to adapt to changing conditions and cater for non-traditional workers. This is coupled with the protection of collective action which disciplines business to operate in the interests of workers. Regardless of this dynamism, gig-economy workers remain excluded from the ambit of labour protection provided to 'employees'. Furthermore, compliance to regulation is imperfect due to a lack of capacity in monitoring and enforcement[77,78].

Labour market composition is available annually and is robust. Labour union effectiveness however requires deeper research to unpack its economic impact while enforcement data tends to be dated. Assessing labour regulation dynamism relies on interpretation of case law while pressure to cater for non-traditional forms of labour is proxied for by rising intensity in public debate and academic research into the topic.

Summary of gap analysis



Government and Inclusivity

The government category directly affects the inclusivity of economic opportunity for businesses, consumers and workers. Government sits at the intersection of business, labour and civil society. Enabling inclusivity of opportunity is therefore a core tenant of government as a means to redress past inequalities and achieve economic equity and prosperity moving forward. The pillar has a direct impact on inclusivity for business as it can offset disadvantages faced by firms operating outside of metropolitan enclaves and improve the competitive landscape for emerging firms through competition policy. For consumers, competition policy can inhibit the exploitation of select groups while regulation around data and cyber-security protect consumers who might not be aware of the value or relevance of their digital footprint. Government has a vital role in impacting inclusivity for labour in two areas. Firstly, labour regulation empowers the disempowered and seeks to guarantee just returns to effort. Secondly, local government and transportation policy eliminate geo-spatial differences in access to opportunity.

The government pillar indirectly affects inclusivity of opportunity by enabling mechanisms for inclusivity along all other pillars. Government entities definethe nature and extent of taxation which facilitates the pursuit of national objectives. For the innovative business pillar, this may play out in terms of government led funding for SMMEs or tax incentives to direct early stage funding to SMMEs. In addition local government policy and incentives can be used to direct growth towards previously disadvantaged areas. For the human capital pillar, funding can be used to reduce financial barriers to educational pathways for key groups while labour market regulation establishes the framework within which organised labour operates in their effort to achieve equity for their members. Competition policy comes to impact the universal digital access pillar by preventing anti-competitive behaviour and predatory pricing which supports the emergence of new businesses that may extend access to previously disadvantaged groups. Finally, in the constructing ecosystems pillar, government is a key participant.

There are significant gaps in the achievement of inclusivity within this pillar. Government faces enormous challenges in the pursuit of inclusivity given the inheritance of business and social structures designed to concentrate opportunity in a select group. Overcoming these challenges is a process. Assessment of the pillar suggests government is aspirational in its pursuit of inclusivity as reflected in the high quality of policy and targets. Execution on policy is arguably a significant stumbling block in the achievement of inclusivity. This is particularly pronounced in the shortfalls of local government. In particular, the lack of unaffordable transport creates significant geographic and income related barriers to accessing economic opportunity.

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Innovative Business

For innovation to occur and digital opportunities to be realized, South Africa's private sector must be well positioned to create and apply innovation processes and technologies. The Innovative Business category firstly looks at the availability of ***innovation finance***. It thereafter reviews three areas that make innovation finance effective: firstly, ***non-financial innovation support*** assesses the effectiveness of the start-up ecosystem and business appetite for collaboration; secondly, ***innovation culture*** assesses the innovative capabilities of entrepreneurs and corporates; finally, ***technology access and use*** investigates business access to and willingness to deploy technology.

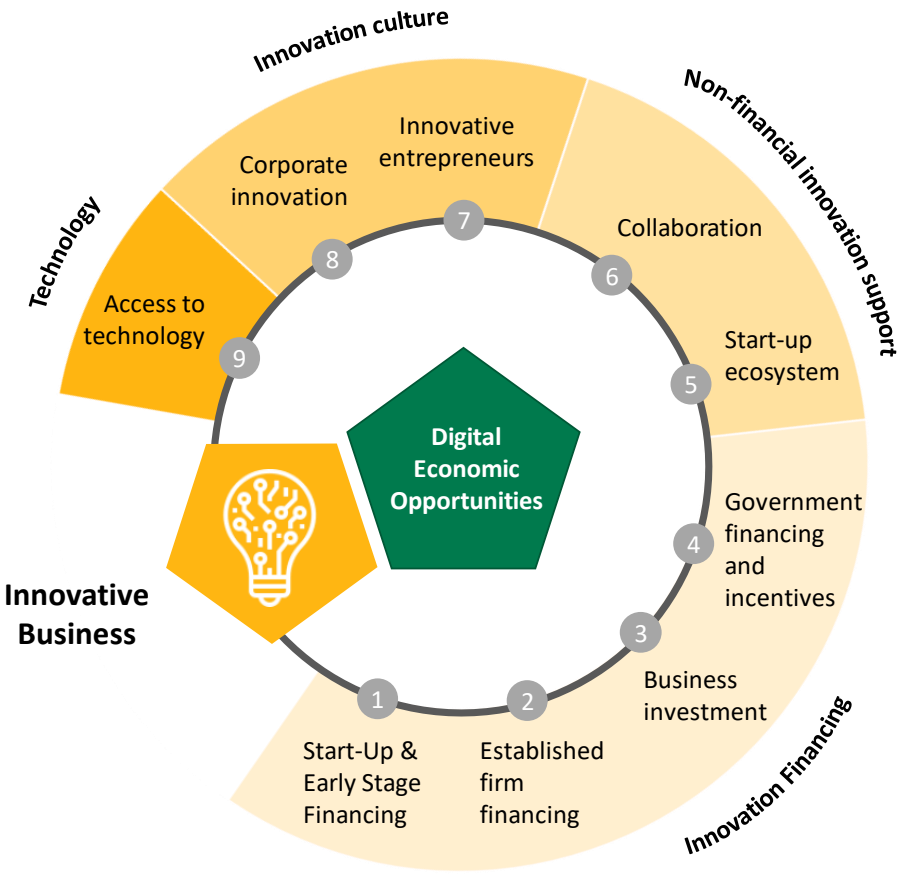
To create and scale digital opportunities, businesses of all maturities require access to capital and incentives to invest in R&D. This financing may come from several sources. Firstly, start-ups require early stage and seed funding. This may include venture-capital and private-equity, angel investors or alternative sources such as crowdfunding. Tax incentives that promote investment in early-stage businesses can help offset the risks of investment. Secondly, established firms require access to functional debt markets and the means to raise funds through capital markets. Thirdly, businesses are independent sources of R&D investment by committing their own funds to innovation. In leading innovative nations, the business sector tends to be the champion source of investment in R&D. Finally, government defines national R&D goals and assists in the pursuit of these goals by investing in R&D directly and stimulating business investment through R&D tax incentives. Direct investment needs to be of a sufficient scale and be targeted to maximize pay off in areas where South Africa has a competitive advantage and where there are social development prospects.

A well-functioning start-up ecosystem and appetite for business collaboration are key to scaling new business models, services and products. These two forms of non-financial innovation support are important for both emerging and established businesses. A start-up ecosystem which can provide mentoring, networks and business model refinement can lead to the scaling of profitable disruptive and tech businesses. A major challenge for digital platforms is developing revenue models which are sustainable and commercially viable. Some of the best-known examples of digital platforms, such as Uber, are still unprofitable and require massive capital investments to continue operating. There are many trade-offs that these platforms need to manage such as subsidizing the cost of services to win customers while managing the demand for platform participants to receive a fair portion of fees and the need to deliver returns for investors. A well-functioning start-up ecosystem can support start-ups in solving these challenges. In contrast to servicing consumers directly, start-ups can provide established businesses with innovative products, services and processes. Between business collaboration provides corporate firms with new innovations and ideas and start-ups with access to large consumer markets, capital and mentorship. Collaboration not only occurs between businesses but can also occur between business lines in a single entity, and between business, academia and service providers.

A business culture of innovation can lead to the emergence, execution and scaling of new digital opportunities. The digital age provides entrepreneurs with access to previously inaccessible markets and the means to scale businesses rapidly. Some of the most successful exponential businesses are execution on individuals' ideas and not designed by incumbent corporate firms. Entrepreneurs with positive attitudes, a willingness to embrace risks and an eye for opportunity can leverage the tools offered by the digital age and become sources of employment. Likewise, corporates require innovation processes that align with business objectives which enable agile development and the scaling of new products and processes. This requires institutional flexibility, digital maturity and a 'fail fast' mindset. Corporate leadership that recognise the value of innovation, and its limits and opportunities are better positioned to unlock resources and avoid wastage.

Businesses of all sizes and maturities require access to digital technologies and a willingness to deploy them when appropriate. Accessing and leveraging the opportunities of the digital age often requires technology and the ability to tap into digital networks. These technologies may help firms better service their customers, reduce the costs of operation or assist business expansion. Emerging and established firms both require access foundational technologies such as payments integration and cloud computing to frontier technologies such as IOT or AI. The availability of technology needs to be matched with an appetite for their deployment. The effective deployment of technology is depressed by risk adversity, a lack of understanding of the value technology can provide and the absence of deployment skills or service providers.

The specific readiness conditions to be measured are listed in the diagram below, and a summary of the measurement for each condition follows thereafter. The full detail of the condition measurement is available in Appendix IV.



Innovation Finance

1 **Start-up and early-stage finance provide emerging firms that have high growth potential with the means to scale newly developed products and processes.** There is a **large and closing gap** in this measure. South African start-ups have access to local capital offered by an emerging venture capital (VC) and private equity (PE) sector and growing angel investor network. This is complemented by growing interest from international investors[79]. Despite this, seed and early-stage financing is in shortage in the USD 50k to USD 500k range[80]. The PE and VC sectors are well run and expanding, have a good history of performance and exits with access to VC capital considered above global averages.[81,82] The Section 12J tax incentive has been key in the growth of VC funding, providing an attractive tax deduction that motivates investment in VC firms targeting employment creating SMMEs. The incentive has grown rapidly in use - the estimated 30 12J funds in 2015 accelerated to over 100 in 2018, becoming a non-negligible source of finance at approximately R1.5 billion under management.[83,84] On the demand side, there is a gap in entrepreneur ability to secure funding due to unrealistic valuations and insufficiently developed strategies.[85] In terms of alternative finance, the most common crowdfunding models are in direct infringement of multiple financial services regulations. Subsequently only a handful of innovative crowdfunding models have emerged.

Select Measurements from Appendix	Score	Source
Share of firms receiving VC funding *(%)*	49%	VC4A

Average VC funding value *(USD)*	USD 253,488	VC4A
Number of direct funders (*No.)*	71	ANDE
Share of direct funders that are foreign (*%)*	30%	ANDE
Share of start-ups receiving local funding (*%)*	41%	VC4A
Share of start-ups receiving international funding (%)	14%	VC4A
Share of start-ups receiving combined funding from local and international funders (*%)*	45%	VC4A
Venture Capital Availability (*country rank)*	47/139 (1 is best)	WEF Global IT Report
VC investments made (2017) *(ZAR)*	R1,160 million	SAVCA
PE Growth rate (1994 – 2017) *(CAGR)*	9.4%	SAVCA
PE funds under management (2017) *(ZAR)*	R158.6 million	SAVCA
Value of 12J tax relief (% of investment)	45%	

2 **Established firms seeking to expand operations or develop new products and business lines have access to a high-quality banking sector and mature capital markets.** South Africa has a world-class financial system which ranks 18 of 140 markets in its efficiency, trustworthiness and confidence.[86] There is a deep availability of credit, with domestic credit provided to the private sector estimated at 144% of GDP - in line with OECD averages[87]. South Africa's banking sector is a key financer of this credit at 66% of GDP and nearly 10% above global averages[88]. The banking sector is robust given its strong regulatory and legal framework and is competitive with a host of well-established and emerging institutions. South Africa's capital markets are significant relative to global benchmarks with listed domestic companies' market capitalisation second only to Hong Kong[89]. South Africa subsequently ranks 25th globally in ease of raising capital through the public sale of shares.[90] Alternatives to the incumbent JSE such as ZAR X and 4 Africa Exchange are gaining traction.[91]

Select Measurements from Appendix	Score	Source
Financial System Index *(country ranking)*	18/140 (1is best)	WEF Global Competitiveness Index
Domestic credit to private sector as share of GDP (%)	144%	World Bank
Domestic credit to private sector as share of GDP *(country rank)*	10/??	WEF Global Innovation Index
Bank credit to private sector (*% of GDP)*	66%	World Bank
Bank credit to private sector – Global average (*% of GDP)*	53%	World Bank
Lafferty Ranking of South African (*country ranking)*	6/38 (1 is best)	Lafferty
Soundness of banks (*country rank)*	37/137 (1 is best)	WEF Global Competitiveness Index
Listed domestic companies market capitalisation (*% of GDP)*	321%	World Bank
Integrated Reporting Quality Ranking (*Country rank)*	1/10	International Integrated Reporting Council
Ease of raising capital through issuing shares on the stock market (*country rank)*	25/137	WEF Global Competitiveness Index

3 **Business sector investment in R&D and innovation can unlock new forms of value and employment.** There is a **small and widening** gap in business investment in R&D. The business sector contributed 38.9% to gross expenditure on R&D in 2016, placing South Africa at 37 of 63 countries in business share of government expenditure on R&D (GERD) and slightly below sample averages.[92,93] Business' share of R&D has slid by 3% since 2012.[94] In high performing innovative nations, R&D is driven by the business sector with business share in GERD generally

far higher than in South Africa. With local returns to R&D exceeding those in France the USA and OECD averages, South African firms appear risk averse.[95,96] This risk adversity may be a function of declining business confidence which depresses business investment[97].

Select Measurements from Appendix	Score	Source
Business share of GERD *(%, 2016)*:		
South Africa	38.9%	UNESO, DTI
Brazil	45.04%	
Russia	28.1%	
China	76.05%	
Sample average (63 countries)	38.44%	
Business returns to R&D *(%)*:		
South Africa	118% - 294%	World Bank
France & United States	28% - 78%	
Taiwan	8% - 35%	
Business Confidence Index (*Index) South Africa*		
2012 (June)	109.9	SACCI BCI
2014 (June)	103.8	
2016 (June)	95.1	
2018 (June)	93.7	

4 **Government facilitates innovation through direct investment in R&D and tax incentives that motivate private sector investment.** There is a **large and closing gap** in this measure. As of 2017, GERD was 0.77% of GDP – akin to global and Indian averages however substantially far below top performing BRICS nations and the OECD average of 2.5%[98]. Government have set ambitious targets for GERD, seeking to double spend to 1.5% of GDP by 2020.[99] Government accounted for 44% of gross expenditure on R&D in 2015 – nearly 10% higher than a sample of 36 countries including OECD benchmarks.[100] The 11D tax incentive offers a maximum of 150% tax deduction on R&D. This is a competitive policy when benchmarked to innovation leaders and BRICS comparators and has been effective in recipient firms: data from 2012 shows that 75% of companies whose 11D application was approved attributed the creation of new products to the tax incentive[101]. Unfortunately fund administration remains a weakness with severe backlogs in application approvals limiting disbursement.

Select Measurements from Appendix	Score	Source
GERD *(% of GDP; 2015)*:		
South Africa	0.77%	UNESCO
Brazil	1.34%	
Russia	1.09%	
India	0.61%	
China	2.05%	
OECD Average	2.5%	
Government share of GERD *(%)*		
South Africa	44.6%	UNESO
Brazil	33.56%	
Russia	68.17%	
China	20.03%	
Sample Average (68 markets)	45.62%	
Maximum R&D Tax Deduction *(% of investment)*		
South Africa	150%	Deloitte
Brazil	200%	
Russia	150%	
India	15%	
China	75%	

Fund applications adjudicated *(number)* *2014* *2012*	 97 218	Standing Committee of Finance

Non-financial innovation support

5 A start-up eco-system that provides non-financial capacity development is required to support the sustainability of start-ups and translate ideas into tangible proofs of concept. There is a **small and closing gap** in this measure. South Africa has the most mature and robust start-up ecosystem on the continent comprised of nearly 100 providers of capacity building and support across the lifecycle of business. [102,103] The community of incubators, accelerators and shared working space collectively meet five key criteria for this system to be effective: there is access regardless of industry; support spans the start-up lifecycle and range of start-up requirements; there are efforts to broaden access beyond urban centres; support provided by the ecosystem is of a high quality, and; the ecosystem facilitates access to capital with ecosystems participants more likely to access funding and generally receiving 3 times the value of funding than their non-participant counterparts.[104] Access to networks, mentoring, marketing, and business strategy/planning are the most common forms of capacity development provided to emerging business while investor matchmaking and showcasing are uncommon.[105] The performance of the ecosystem may be improved through an ecosystem coordinator, skills and capacity training for ecosystem service providers and a focus on internationalisation.[106,107]

The assessment drew on industry reports and research conducted by a renowned multi-national entity that conducts research on and advocates for entrepreneurs. Findings are a strongly guided interpretation of available anecdotal evidence regarding the scale and perceived quality of the ecosystem.

6 Business willingness to collaborate with other enterprises and leverage support networks ae important sources of new ideas and capabilities. There is a **small and closing gap** in business collaboration. At nearly 90% of surveyed business, South African corporates rank above global averages in the desire to collaborate with emerging business, are intent on learning from competing firms, service providers and academic institutions and rank 59 of 126 countries in innovation linkages and business willingness to collaborate for ideas and research.[108,109,110] This has seen the emergence of open innovation platforms and recognition by innovation leaders that these are key sources of co-creation and ideation. South African enterprise scores far above global averages in knowledge sharing within business and between business functions.[111]

Select Measurements from Appendix	Score	Source
Share of business actively engaging with external sources for new ideas – RSA; Global Avg. *(%)*	66%; 59%	PWC Global Digital IQ Survey
Innovation Linkages *(country rank)*	59/126 (1 is best)	WEF Global Innovation Index
Business University collaboration *(country rank)*	28/126 (1 is best)	WEF Global Innovation Index
Share of large firms affirming importance of collaboration *(%)*	89%	Accenture Open Innovation & Digital Collaboration Report

Innovation Culture

7 **Innovative entrepreneurs are a key source of new products, services and business models and can create significant employment opportunities if given the opportunity to scale.** There is a **small and closing gap** in the innovation culture of South African entrepreneurs. South African entrepreneurs are innovative with 48% believing they produce products that are new to some or all customers and 43% believing their products differ from those offered by other businesses. This is above continental averages.[112] The GEDI assessment of the South African ecosystem suggests there are no gaps in entrepreneurial capacity for product and process innovation. [113] South African entrepreneurs are primarily opportunity motivated and therefore interested in the creation of value and the pursuit of growth. These innovative entrepreneurs have positive attitudes, and rank second on the continent and 55th of 137 counties in their attitudes, aspirations and abilities.[114] These capabilities have translated into an emerging ICT start-up community[115]. Despite these innovative qualities and an emerging digital orientation, the scale of South African entrepreneurial activity ranks poorly relative to competitors while shortfalls in entrepreneur skills persist.

Select Measurements from Appendix	Score	Source
Total early stage entrepreneurial activity (TEA) *(% of adult population)*	6.9%	GEM
TEA (*country rank)*	52/65 (1 is best)	GEM
Share of TEA that are opportunity motivated *(%)*	74.4%	GEM
Share of TEA that believe that their product is new to some or all customers *(%)*	47.9%	GEM
Share of TEA that believe that product is new to some or all customers – African Average *(%)*	42.6%	GEM
Global Entrepreneurship Index (Attitudes, Abilities, Aspirations) *(country rank)*	55/137 (1 is best)	GEDI Entrepreneurship Ecosystem of South Africa

8 **South African corporates require a sophisticated approach to innovation that aligns with business objectives and makes necessary resources available.** There is a **small and closing gap** in corporate innovation culture. South African corporates are in the early to middle stages of the innovation process maturity cycle.[116] These stages reflect a growing entrenchment and genuine institutional vision for innovation and an innovation strategy that aligns with and supports broader business strategy.[117,118] This processes is in evolution - 85% of Accenture surveyed firms are deploying dedicated innovation teams while the majority of business consider innovation a strategic imperative and have innovation targets appear in business plans.[119,120] The bulk of local firms are in the middle stages of digital maturity - generally higher than global averages – and are therefore well positioned to pursue and leverage digital innovations.[121] These firms have leaders who are enabling innovation and are a strength in established business' innovation landscape[122,123] Leadership commitment to innovation is supporting business competitiveness, however surveyed business suggests the innovation competencies of leaders are sometimes inadequate and can create obstacles.[124] South African CIOs and CEOs are also believed to score below continental and global averages in their perceived ability to assimilate new technologies into an organisation[125]. South African

enterprise recognise the role an agile workforce plays in enabling innovation and are in the early stages of embracing flexible work arrangements and on the job learning[126].

Select Measurements from Appendix	Score	Source
Share of businesses in stage of innovation maturity *(%)* *Ad Hoc* *Emerging* *Define* *Integrated* *Optimised*	 14% 44% 34% 8% 0%	CLC South Africa Innovation Capabilities Report
Business Innovation Capabilities Index *(Index)*: *Innovation Strategy* *Linkages* *Innovation Process* *Organisation* *Innovation Learning*	 4.04 (6 is best) 3.97 (6 is best) 3.81 (6 is best) 3.79 (6 is best) 3.78 (6 is best)	CLC South Africa Innovation Capabilities Report
Share of businesses in stage of digital maturity - RSA; Global Avg. *(%)*: *Digital Laggards* *Digital Followers* *Digital Evaluators* *Digital Adopters* *Digital Leaders*	 6%; 9% 24%; 30% 39%; 33% 23%; 23% 5%; 8%	Dell Digital Transformation Index
Share of managers considering innovation a business opportunity *(%)*	96.6%	Steyn & Bell, Univ. of Stellenbosch
Share of managers the perceive innovation as a strategic business priority *(%)*	78.9%	Steyn & Bell, Univ. of Stellenbosch
Share of businesses that have innovation objectives appear in business plans *(%)*	52.9%	Steyn & Bell, Univ. of Stellenbosch
Share of businesses considering a fluid workforce a means to improve innovation performance (*%)*	76%	Accenture

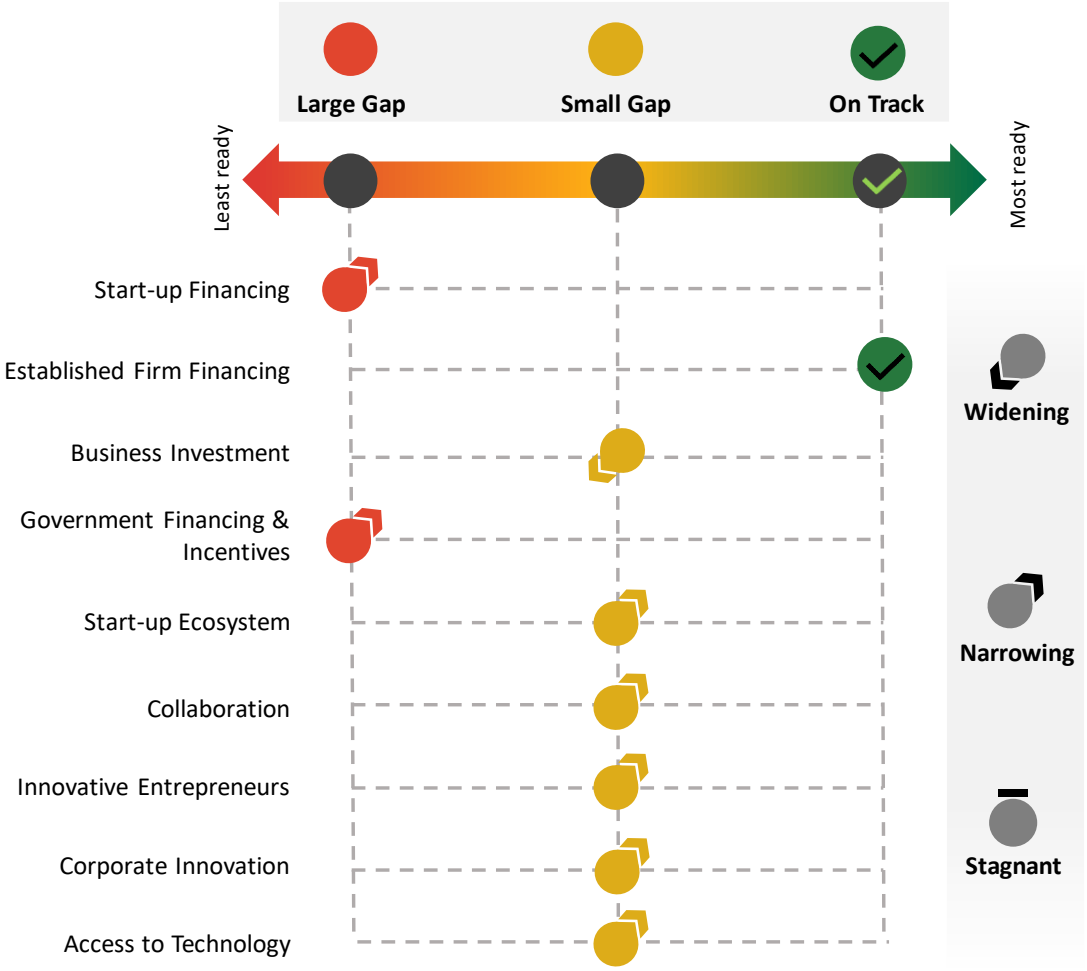
Attitudes to and usage of technology

South African businesses need to have ready access to and positive attitudes towards technology so that it can be effectively used to improve productivity and competitiveness. There is a **small and closing gap** in this measure. The Global Innovation Index suggests South African firms are above global medians in access to the latest technology.[127] Local firms are believed to adopt new technologies more extensively than continental competitors and global averages. Despite this, many businesses seem to approach new technology cautiously and adopt a 'wait-and-see' attitude.[128,129,130] Frontier technologies have healthy adoption in a handful of cutting-edge South African firms. Across all frontier technologies (with the exception of robotics) cost was not the most common impediment to adoption. This implies that deeper factors such as attitudes to innovation, institutional culture and skills are key in unlocking the effective use of technology. Laggard adopters struggle to see the broader benefits these technologies bring such as fundamentally changing production processes or accessing consumer insights. The majority of South African SMMEs have at least basic access to technology with 97% using a smart-phone and 94% access to LTE networks.[131] Technology enabled SMMEs are well positioned to compete in the digital age and recognise the need to remain technologically relevant with almost 25% making use of the latest technology.[132] However nearly 50% of emerging businesses have little to no new technology orientation and

consider technology access a challenge to growth.[133,134] Costs and education are barriers to adoption.

Select Measurements from Appendix	Score	Source
Availability of the latest technology *(country rank)*	41/139 (1 is best)	WEF Global IT Report
Firm adoption of the latest technology *(country rank)*	28/126 (1 is best)	WEF Global IT Report
SMMEs with no access to smartphones *(%)*	3%	SME South Africa Landscape Survey
SMMEs with no access to LTE networks *(%)*	6%	SME South Africa Landscape Survey
Share of SMMEs considering technology access a barrier to growth *(%)*	50%	SME South Africa Landscape Survey
Share of SMMEs using latest technology – RSA; African Avg. *(%)*	26%; 26%	GEM
Share of SMMEs using new technology – RSA; African Avg. *(%)*	29.2%; 19.5%	GEM
Share of SMMEs using no new technology – RSA; Africa Avg. *(%)*	44.9%; 54.4%	GEM
Share of established business using frontier tech. *(%)*: *IOT* *VR/AR* *Big Data & Machine Learning* *Robotics* *Blockchain*	 66.1% 13.6% 13.4% 6.2% 3.2%	World Wide Worx, Syspro – The Mobile Corporation in South Africa
Share of business citing cost is the primary inhibitor to frontier tech adoption *(%, average across tech.)*	31%	World Wide Worx, Syspro – The Mobile Corporation in South Africa

Summary of gap analysis



Innovative Business and Inclusivity

The innovative business category has a wide range of direct effects on inclusivity as it determines business access to opportunity, creates opportunities for workers when businesses scale and defines the nature of employment created through choices around technology. Emerging businesses are key drivers of employment who become the gatekeepers of worker access to opportunity. These businesses require the means to scale effectively. The elements that enable scaling are not necessarily in equal supply or equally accessible for all businesses: incubators and accelerators tend to be concentrated in metros; start-up access to technology which provides access to new markets may be out of reach due to cost, geography or education; while finance may be directed to a narrow set of firms that comply with certain criteria. Depending on how business decides to use technology may furthermore impact inclusivity by substituting low-skill labour with digital processes that are generally developed, deployed and managed by a group of skilled individuals.

The pillar has narrow indirect effects on inclusivity of opportunity through its impact on two other pillars. Enabling the emergence of innovative businesses can improve local competition and benefit consumers and workers. In the Universal Digital Access category, geographic barriers to accessing digital networks and the high costs of data are partly attributable to poor competitive forces. The innovative business pillar's mechanisms enable the emergence of disruptors such as Rain which can alter the competitive landscape and motivate firms to expand and improve service offerings to a wider range of clients. The category furthermore comes to influence inclusivity through human capital and its impact on employment. Businesses determine their strategic imperatives and formulate staff sourcing programs around these. Business hiring norms thereby define who may access work opportunity. These norms may reflect perceptions of accreditation quality which are applied as immediate applicant filters and lead to the rejection of students based on educational pathway and institution. In addition, business decisions around technology use inform the nature of skills required.

There are gaps in inclusivity in this pillar due to barriers in emerging business access to finance and technology. There is a drastic shortage of finance for SMMEs - in 2010, a Finscope survey estimated that 13% of formal businesses had access to funding[135]. The IFC estimates the scale of the funding gap at 10% of GDP and Finfind estimates the value of the gap between R86 and R346 billion[136,137]. Nearly 25% of early stage business closures are due to a lack of access to finance - 50% above African averages[138,139]. Previously disadvantaged SMMEs are disproportionately affected as they have the greatest demand for finance and are more likely to be owned by individuals who were previously disadvantaged - whereas 85% of micro-enterprises are owned by previously disadvantaged individuals, 45% of medium size businesses are owned by previously disadvantaged individuals. [140,141] This translates into 81% of SMMEs seeking finance being previously disadvantaged.[142] In addition, the majority of funding sources do not support start-ups in the completion of applications which may disadvantage start-ups with lower levels of education and capacity for bookkeeping. There is finally unequal access to technology for businesses. SMMEs without technology access are excluded from leveraging digital services and accessing broader consumer markets. As with the 44% of South African SMMEs without a new technology orientation, costs and low levels of STEM skills are likely the primary barriers to access[143].

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Constructing Ecosystems

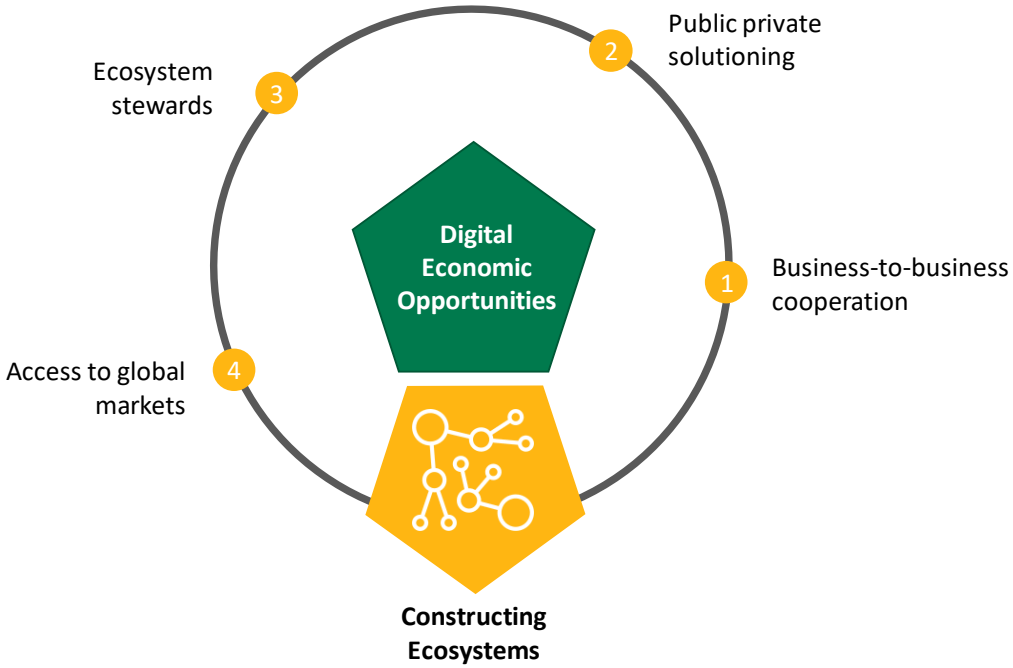
Central to the scalability of emerging economic opportunities is the presence of an affordable and high-quality network of support service providers and ecosystem co-ordinations. The Constructing Ecosystems category considers this in terms of the presence of organisations and structures that act as ecosystem stewards and improve South Africa's capabilities to market to global demand.

Ecosystem stewards form the basis of a tech support ecosystem. Individuals and institutions that communicate market signals between stakeholders improve the visibility of local industry requirements and capabilities. This includes researchers, consultancy service providers, and partnership brokers that connect innovators and businesses together. Ecosystem facilitators play different roles within different opportunities. For GBS, for example, an ecosystem coordinator would also be critical in creating an efficient skills matching system between business and talent development agencies. In addition, they would coordinate the creation of a strategic value proposition, discussed in the next paragraph.

In order for South Africa to tap into the global market it will need to craft a strategic value proposition that is attractive to the global market. This would require market intelligence on South Africa's specific competitive advantage. The research and marketing of this value proposition would need to be driven at a government and industry association level. BrandSA and Invest SA are examples of government-led marketing vehicles that communicate South African industry's value proposition. Private sector-led, public sector-led or public-private-partnership led vehicles may be equally or more effective. Marketing business capabilities to the global market would typically take the form of an in-country visit such as presenting at a tech expo or leveraging an in-country partnership.

Marketing to global demand is necessary, specifically for capturing the increasing demand for Globally Traded Services as well as attracting businesses to establish South Africa as a hub for frontier technology. For example, for GBS it may be necessary to leverage an in-country partnership through a broker that has a good knowledge of South African GBS business capabilities. This would require access to funding requirements for companies that want to effectively access the global market and leverage broker relationships, particularly for emerging providers. There is also a need to create direct relationships with the offshoring companies that use major international BPOs to decide on offshore destinations. This would require South African industry representatives that can create those relationships and maintain them for a longer-term positioning of South Africa as a desirable offshoring destination.

The specific readiness conditions to be measured are listed in the diagram below, and a summary of the measurement for each condition follows thereafter. The full detail of the condition measurement is available in Appendix IV.



1 **Having a cooperative and well-organized private sector allows industries to gather market intelligence and craft a competitive and specific value proposition**. Industry coordination in South Africa suffers from a **large and stagnant gap**. There is a relatively well-developed organized business community with a large presence of industry and apex business associations. However, it is not clear whether these associations have taken the responsibility to coordinate businesses to market to the global market.[144] The BPS association BPESA provides an example of high performance by sourcing market intelligence and crafting a value proposition that can be marketed to global players. The apparent lack of industry coordination is evident in the fact that most market intelligence practices are at a firm level.[145] There is little progress being made to close this significant gap.

The measure relies on a base of anecdotal evidence and academic publication, both validated against stakeholder insights. The assessment acknowledges that BPESA may not be the sole entity successfully playing a coordinating and intelligence sourcing role. However, in the absence of visible alternatives, it is feasible to conclude that entities playing similar roles are scarce.

2 **Effective co-ordination between the public and private sector assist in identifying and removing policy and regulatory blockages to take up economic opportunities.** Public private solutioning in South Africa has **a large though closing gap**. South Africa has a number of institutions and ad-hoc structures designed to facilitate public private engagement, such as the National Economic Development and Labour Council (NEDLAC) and its recent Presidential Jobs Summit. However, these institutions and structures are often not effective at arriving at solutions for specific areas of opportunity given the nature of nationally-representative consultation.[146] A recent development in South Africa is aiming to address this issue directly. The Public Private Growth Initiative (PPGI) brings together business and government leaders in specific sectors to design 5 year growth strategies in each sector by identifying specific projects and the public sector enablers required for them to scale. This provides a more

effective means to unlock specific opportunity as opposed to instituting broad developmental processes.

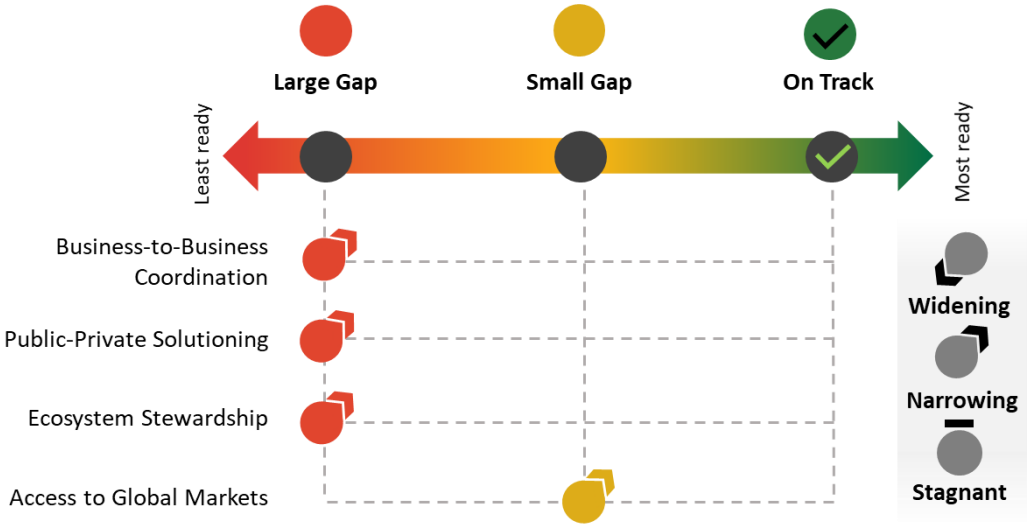
The measure captures the complexities of decision making within multi-agent systems through readings of regulation and observation of developments in the market. The nature of the measurement means data related evidence would need a highly accurate focus to be meaningful.

3 **Organisations that can catalyze cross-sectoral partnerships and develop common agendas for change play an important role in realizing economic opportunities.** Ecosystem stewardship in South Africa has **a large though closing gap**. South Africa has a number of organisations playing this ecosystem stewardship role across a number of areas and with a mix of models.[147,148] However, these organisations are not widespread and could be replicated across a number of sectors with emerging opportunity, particularly if there is additional research on understanding where these models work best. Ecosystem stewards with strong private sector involvement may provide an added advantage because they bring the necessary expertise and social capital to provide sector-specific strategies and can enlist support from public intermediaries as needed. The Harambee Youth Employment Accelerator illustrates the potential of ecosystem stewards. The firm sources, screens and upskills young South Africans to take up jobs among Harambee's partner companies.

Ecosystem stewards are an emerging organisational form. Measuring the impact of these organisations is simpler when their effects are direct (as with Harambee) though more complex if effects are indirect and less visible (as with the successful coordination of entities). The condition therefore considers the prevalence, importance and trajectory of stewards in key systems.

4 **In order to access and compete in the global market, business will likely require the aid of effective export promotion incentives and vehicles. In addition, brokers are needed to facilitate international connections and relationships**. There is a **small and closing gap** in the ability for South African businesses to access global markets. There are incentives and support structures that are crucial for export promotion: InvestSA is the award-winning official investment promotion agency which offers a 'One Stop Shop' detailing sector specific value propositions[149]; through the Export Marketing & Investment Assistance Scheme (EMIA), the DTI assists with the identification of new export markets through market research and helps companies strengthen their competitive advantage by supporting patent registrations, quality marks and product marks.[150] There are also marketing channels through which South African capabilities can be marketed to the global market such as BrandSA. However, there remains a gap in expanding these channels to growing industries. Access to these marketing channels is limited for smaller players who lack awareness of these services or the capital to pay for such connections. The DTI aims to correct this by compensating businesses for costs incurred recruiting in new FDI into South Africa.[151]

Access to global markets is evaluated in terms of the presence and perceived effectiveness of coordinating and dedicated entities. The direct economic impact of export and investment promotion is difficult to estimate and divorce from trends.



Constructing Ecosystems and Inclusivity

The constructing ecosystems pillar is dynamic and can directly impact inclusivity in any systems wherein businesses, consumers or workers operate. Coordinators and stewards can emerge in any system where there are avenues for achieving mutually beneficial cooperation. Their role in the creation of ecosystems is invaluable as ecosystems are fundamental to unlocking and scaling opportunity – interests are aligned, uncertainty is reduced, and resources are unlocked. Small-scale businesses are offered new avenues to market themselves to international demand while previously disadvantaged work seeking youth are provided with programs that offer access to new job opportunities. These effects and others translate into widening access to opportunity for workers and businesses.

The pillar indirectly impacts the inclusivity of economic opportunity through the mechanisms of all other pillars. In the human capital pillar, alignment of business needs with educational institution curricula can better ensure graduates from all institutions and pathways are equally positioned for accessing opportunity. An intermediary such as Harambee can serve to close this gap outside of the established education ecosystem. For the innovative business pillar it provides a means of coordination within the start-up ecosystem to support the emergence of new enterprises championed by previously disadvantaged individuals. Within the government pillar, coordination and alignment between business and local government can unlock business opportunity for emerging firms and create economic opportunities for businesses operating outside of traditional economic hubs. This is achieved through improved communication and the elimination of any potential information asymmetries. Finally, in the universal digital access pillar, an ecosystem steward may assist service providers in identification and execution on extending access to unconnected communities and draw government into alignment with these strategies.

The pillar has had positive impacts on economic inclusivity however more can be done to support the emergence of ecosystems and coordinators. Export promotion systems are effectively structured and perform well, however the degree to which they support previously excluded firms and broadened employment opportunity is uncertain. Similarly, the outcomes of the PPGI are yet to be seen. The champion example of an ecosystem steward – Harambee

- has been successful in channelling employment opportunities to disempowered youth, however this is a single instance of scaled success that signals the potential the model has.

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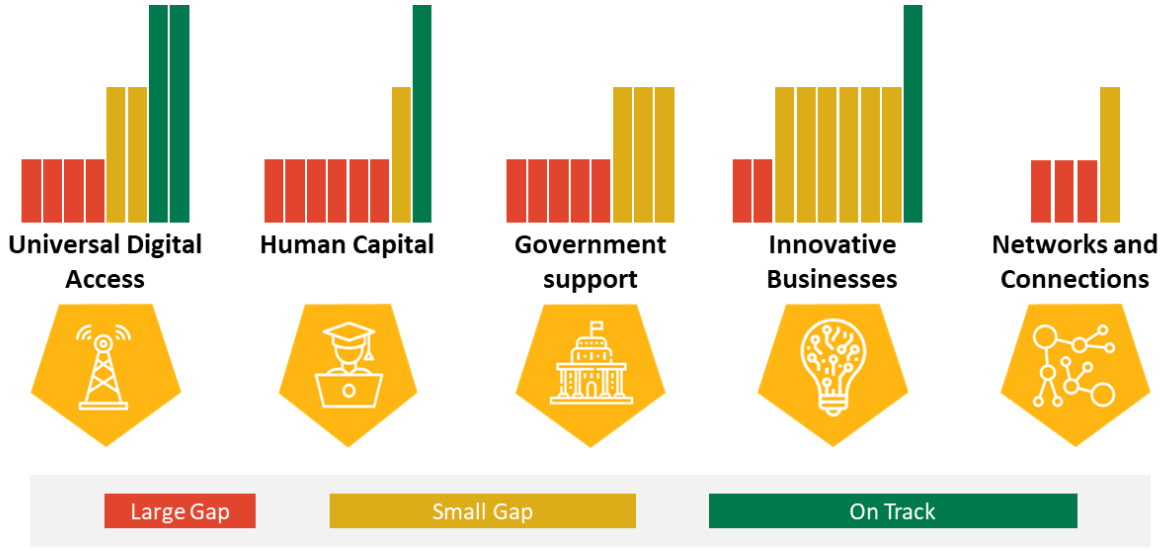
Cross-Pillar Conclusion

South Africa exhibits a few pockets of readiness and numerous outstanding gaps in conditions necessary for taking up the economic opportunities presented by the digital age. As with South Africa's foundational economic structure, dualism in readiness conditions exist – there are instances of world class sophistication and instances of significant shortfall. These shortfalls can disadvantage select communities, workers and businesses as access to the 'world-class' may be barred by educational, income, geographic or some other requirements.



The **Universal Digital Access** pillar provides businesses, individuals and workers with the fundamental means of accessing the digital world. The conditions that are 'on track' are infrastructure based and provide a solid foundation for competing in the global world and leveraging the local digital market. Despite this, high data costs and the distribution of access remain a concern which are partly underpinned by market structure, sub-optimal competitive forces, and regulatory lethargy.

Readiness in the **Human Capital** pillar is concerning given its foundational role in individual and business capacity, and long lead times in transformation. Micro-credentialing is an alternative, short-term solution to the significant gaps observed in the traditional foundational and higher education system. This is yet to scale and faces cost and accreditation-related barriers to broadening usage. The key strength – access to raw talent – is demographic in nature. This illustrates how the most significant gaps are institutional leading to a shortage of skills and weak capacity to rapidly produce these skills.

The **Government Support** pillar suffers from numerous large gaps. The bulk of these are at a sub-national level which reflects the challenges of inherited distributional inequalities. Analysis of the pillar suggests government is aspirational and capable of defining world-class and comprehensive policy however execution on this policy is inadequate. Developments in local government policy are promising although yet to demonstrate tangible outcomes.

Conditions in the **Innovative Business** pillar mostly suffer from small gaps with relatively few instances of large gaps. These findings illustrate the strength of the South African private sector and the availability of world-class financial and business capabilities. While the internal innovative capabilities of established business are maturing, support start-up and SMME access to international markets and promoting partnerships with South African corporates can ignite growth. Start-up support is an important inclusivity dimension as there are income and educational barriers to accessing opportunities.

The **Constructing Ecosystems** pillar helps businesses and communities to co-ordinate activities, align incentives and unlock resources. Coordination and support in accessing markets are key means for scaling opportunities. While the bulk of conditions exhibit large gaps, there are examples of high performance and successful ecosystem constructing entities. Successes such as Harambee as an ecosystem steward and BPESA as an industry coordinator offer the opportunity for replication while the emergence of the PPGI signals a maturing approach to public private solutioning in the pursuit of economic growth.