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TABLE OF CONTENTS

1. INTRODUCTION.....	1
2. SOUTH AFRICA IN THE DIGITAL AGE	3
The global digital economy	4
South Africa's digital economy	5
An ICT and digital economy masterplan for South Africa	6
3. DIGITAL ECONOMY BIG BETS	10
3.1. Physical technology production.....	10
3.2. Transformative tech applications	19
3.3. Digital platforms	27
3.4. Digitally traded services	33
4. CRITICAL ENABLERS FOR DIGITAL ECONOMY DEVELOPMENT	39
4.1. Digital inclusion.....	39
4.2. Skills for work.....	44
4.3. Responsive governance	49
4.4. Innovation and competitiveness.....	52
4.5. Government digitization	56
5. ECOSYSTEM COORDINATION IN THE DIGITAL ECONOMY	60
5.1. Government coordination.....	60
5.2. Public private solutioning	61
5.3. Open data sharing	62
6. PRIORITY ACTION PLAN.....	67
7. IMPACT OF IMPLEMENTING THE MASTERPLAN	69
7.1. Inclusive growth	69
7.2. Job creation	71
7.3. Transformation.....	73
APPENDIX: ACTIONS IN THE PRIORITY ACTION PLAN	76

List of figures

Figure 1: The structure of the digital economy	3
Figure 2: Examples of digital technologies, products and services.....	4
Figure 3: Growth in global internet protocol traffic.....	5
Figure 4: ICT and Digital Economy Masterplan Framework.....	9
Figure 5: South Africa's digital economy big bets.....	10
Figure 6: 2018 top ten manufacturing countries	11
Figure 7: Key emerging technologies	11
Figure 8: Imports and exports of electronics for South Africa	12
Figure 9: South Africa's productivity growth rate (Period 1996-2006 & 2006-2018	13
Figure 10: South Africa's electronics manufacturing output (Rbn) 2014-2018.....	14
Figure 11: Process of transformative tech application development.....	21
Figure 12: Use of digital platforms in South Africa by Sector and Function	29
Figure 13: Examples of platforms in the key areas of South Africa's platform economy	32
Figure 14: Areas for expanding globally-traded services in South Africa.....	34
Figure 15: Job creation potential in digitally traded services	Error! Bookmark not defined.
Figure 16: Critical enablers for digital economy development.....	39
Figure 17: Harambee mapping of the most in-demand digital jobs.....	45
Figure 18: Ecosystem coordination in the digital economy	Error! Bookmark not defined.
Figure 19: The NASSCOM Centre of Excellence coordination model	62
Figure 20: Global job capacity in the digital economy over the next 5 years	72

List of case studies

Case study 1: Lightware, producers of Lidar	15
Case study 2: An example of South African technology production	16
Case study 3: Joule & Mellowcabs.....	17
Case study 4: Aerobotics precision agriculture solution.....	23
Case study 5: CMO integrated forest management system.....	24
Case study 6: Discovery telehealth	25
Case study 7: EMGuidance digital healthcare platform	25
Case study 8: Iyeza Health.....	26
Case study 9: Regulatory overlap in the drone economy.....	51
Case study 10: Astrofica Technology	64
Case study 11: Linkedto	66

List of boxes

Box 1: Assumptions and calculations for Masterplan objective targets	8
Box 2: The value of digitized government data	56

1. INTRODUCTION

Digital solutions have become a major part of our lives, presenting enormous opportunities for South Africa to charter a new digital-driven development path. Other developing countries – such as China, India, Malaysia, Kenya, Egypt, Mauritius and many others - have shown that digital economy development is an essential national growth strategy, and that the rewards are large. As many of the traditional employment pathways start to close off due to automation and the reshoring of global value chains, the digital economy offers South Africa's most promising pathway to collective prosperity.

This Masterplan has been drafted at a time of fundamental change in South Africa as digital technologies become mainstream and the world adjusts to the COVID-19 pandemic. Since the mainstreaming of the internet and personal computers from the 1980s, digital technologies have been evolving and converging to completely reshape the way people live and work. The European Commission is already deliberating on Industry 5.0, and in their 2021 policy brief they caution that “innovation shows no sign of slowing down “ (Breque, et al., 2021)¹. As South Africa reels from the impact of COVID-19, the country has turned to digital solutions more than ever before to help weather the storm.

However, a digital-driven development path comes with equally enormous risks. Arguably the greatest risk is the digital economy worsening rather than alleviating South Africa's dire inequality. It is therefore essential that the country's digital economy is developed inclusively so that all South Africans, irrespective of how much they earn or where in the country they live, can create and benefit from these opportunities. South Africa can no longer afford to pursue development pathways that have not delivered credible gains in equality, inclusion and redress.

Charting this new path to prosperity constitutes an immense task for our nation. For a country that has struggled to industrialise successfully in the past, the task at hand now is to industrialise in a rapidly changing global economy where value is increasingly driven by technology adoption. Failure to invest in modern technologies would almost guarantee a South Africa that is left behind. As it stands, we do not have sufficient skills to participate and compete in the modern economy (Maisiri & Van Dyk, 2019)² We will not succeed as a country in this new technology era if we continue on our current path, with pockets of digital excellence and the majority of the country struggling to catch up with the third industrial revolution. A process of rapid national transformation is necessary through a programme of work that is sufficiently large and widespread to unlock the value the digital economy can create for South Africans.

We can learn from our recent past about what is required for such a process of rapid national transformation. After transitioning to a democracy, South Africa was faced with the enormous task of transforming the economy to address the urgent need for social and economic redress. The country committed to broad-based black economic empowerment as a national priority through a legislative framework that made this the responsibility of every government department and the private sector.

Complimentary to the ongoing process of black economic empowerment, digital empowerment must be South Africa's next national priority. This imperative requires the same degree of unprecedented national coordination mandated across every sphere of government, including investment and activity across the private sector and the involvement of civil society including labour.

¹ Breque, M., De Nul, L. & Petridis, A., 2021. Industry 5.0: Towards a sustainable, human-centric and resilient European industry, Brussels: European Commission.

² Maisiri, W. & Van Dyk, L., 2019. Industry 4.0 readiness assessment for South African industries. South African Journal of Industrial Engineering, 30(3), pp. 134-148.

This Masterplan provides a blueprint and the inception stages for developing this national priority of digital empowerment. It is a mechanism for government to mobilize its social partners and move towards implementation of its policies (Levin & Makgetla, 2019)³. It was developed through a process of rigorous research and extensive stakeholder consultation across the public, private and civil sectors. It sets out the aspirational vision of what the digital economy can deliver in South Africa over the next five years, and a practical action plan achieving this vision. Section 2 sets the stage by reviewing South Africa in the digital age and putting forward a framework for achieving the objectives of inclusive growth, job creation and transformation. Section 3 identifies four digital economy big bets that hold the greatest potential for delivering these objectives. Section 4 unpacks five critical enablers which must be in place for these big bets to pay off. Section 5 tackles the difficult task of coordinating a complex digital ecosystem to deliver on the five critical enablers. Lastly Section 6 summarises the key actions that must be taken across three timeframes: quick wins, medium-term priorities, and long-term investments.

³ Levin, S. & Makgetla, N., 2019. Master plans and industrial policy, Pretoria: Trade Industrial Policy and Strategies.

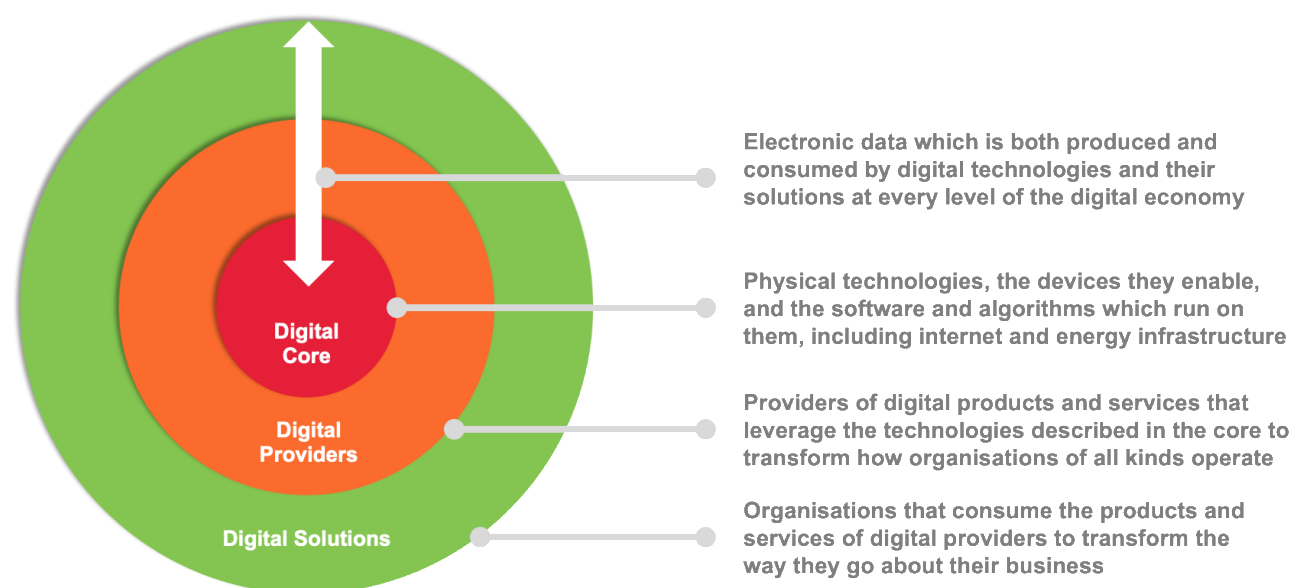
2. SOUTH AFRICA IN THE DIGITAL AGE

The term **digital economy** captures the impact of digital technology on the production, trade and consumption of goods and services. Historically, the term related to the effect of the internet on the economy, resulting in digitally orientated firms and the origination of new technologies.⁴ Today, the digital economy covers these traditional technology, media and telecoms sectors as well as the application of technology to a broad range of sectors like mining, agriculture and manufacturing.⁵ The digital economy is therefore transversal and involves the application of technology to business models across the entire economy. Although there is no standard definition of the digital economy, this Masterplan borrows from the definitional considerations set out by UNCTAD in their 2019 Digital Economy Report:

“Since first coined in the mid-1990s, the definition of the digital economy has evolved, reflecting the rapidly changing nature of technology and its use by enterprises and consumers... In the past few years, the discussion has focused more on the way digital technologies, services, products, techniques and skills are diffusing across economies... Digital products and services are facilitating more rapid change across a wider range of sectors rather than being confined to those high-technology sectors that had been the main focus previously.”⁶

The structure of the digital economy can be represented as three concentric circles which represent a simple value chain.

Figure 1: The structure of the digital economy



Source: Genesis Analytics, 2020

At the core of the digital economy is physical technologies such as semi-conductors and processors and the digital devices they enable, the software and algorithms which run on these devices, and the telecom, data and cloud infrastructure and services and the energy infrastructure which allows them to connect. Digital providers use these technologies to offer a range of digital products and services that help organisations of all types transform the way they operate. This includes website and app development, data analytics, machine learning,

⁴ UNCTAD, 2019, Value creation and capture: implications for developing countries, *Digital Economy Report 2019*, online, available: https://unctad.org/en/PublicationsLibrary/der2019_en.pdf

⁵ Armstrong, 2020, The digital economy is becoming ordinary. Best we understand it, *The Conversation*, online, available: <https://theconversation.com/the-digital-economy-is-becoming-ordinary-best-we-understand-it-130398>

⁶ UNCTAD, 2019, Value creation and capture: implications for developing countries, *Digital Economy Report 2019*, online, available: https://unctad.org/en/PublicationsLibrary/der2019_en.pdf

cloud computing, mobile payment and ecommerce platforms, among many others. These digital products and services are consumed by a range of organisations served by digital providers in order to transform the way they go about their business. These digital solutions include examples like virtual banks, digital media, precision agriculture and e-government. Flowing across all of these levels is the electronic data that is both generated by and used for the operation of digital technologies and their applications.

The global digital economy

The digital economy is important because it is completely restructuring the entire global economy. The reason is that digital technologies are changing the deep forces that determine industrial structure: transaction costs, how information is generated and shared, how production occurs, how products get from producers to consumers, and how risk is managed. Industries such as media, banking, postal services, retail and telephony are being upended by new digital entrants with far lower costs. This process is accelerating and spreading to almost every industry. As such, even seemingly ‘physical’ industries such as tourism, food and transport are being transformed by the application of digital technology

Figure 2: Examples of digital technologies, products and services

	 Automation & production	 Artificial intelligence	 Data management	 Communications
	<i>Autonomous inputs used in business processes and production</i>	<i>Software integration to replicate human thought and processes</i>	<i>Systems of storing, protecting, processing and retrieving data for insights</i>	<i>Sharing information between devices and people</i>
Digital foundations	- Computerised equipment - Batch processing	- Processing power - Electronic datasets	On-site electronic database	- Internet - Mobile devices 3G, LTE
Emerging technology	- Robotics - Autonomous vehicles 3D printing - Real-time processing	- Machine learning - Natural language processing	- Cloud computing - Distributed ledgers - Application programming interfaces (APIs)	- Internet of things - Augmented reality - Virtual reality - Smart sensors 5G
Digital products & services	- Robotic process automation - Drone services - Remote management - Predictive/conditional maintenance	- Predictive analytics - Customer personalisation - Chat bots	- Data cleaning and labelling - Data analytics - Cloud services - Data architecture and management	- Telecommunications - Mobile applications - VR/AR services
Cross-cutting products and services: software engineering, testing, cybersecurity, etc.				

Source: Genesis Analytics, 2020

The impact of this transformative process is already yielding significant development gains across the world. By 2016, the digital economy contributed approximately 15% to global GDP amounting to USD 11.5 trillion. This is estimated to grow to a contribution of around 24% by 2025. Such gains are true for both developed and developing economies, which have been estimated to account for 18% and 10% of developed and developing economies GDP, respectively.⁷ Within the global ICT sphere, research has shown an increase in employment by 5 million jobs between 2010 and 2015, with the expectation that it will continue to grow as the digital economy accelerates.⁸ Other gains from the digital economy will be an outcome of investment in

⁷ Huawei Technologies Co., Ltd and Oxford Economics, 2017, *Digital Spillover: Measuring the true impact of the digital economy*, pp6-8.

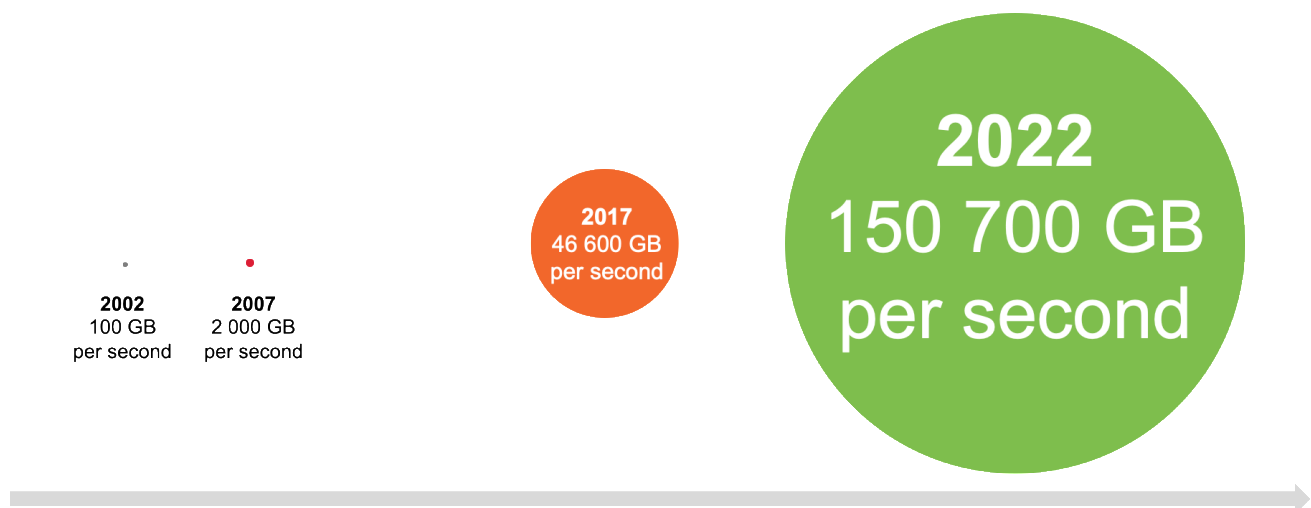
⁸ UNCTAD, 2019, Value creation and capture: implications for developing countries, *Digital Economy Report 2019*, online, available: https://unctad.org/en/PublicationsLibrary/der2019_en.pdf

technologies estimated to be more than six times that of non-digital investments as well as the enhancement of productivity and innovation for firms. An example is the impact of AI on labour productivity estimated to contribute around USD 6 trillion by 2030.⁹

These development gains are being driven by innovation in digital technologies and their applications across the world. Although there is now a very large set of digital technologies and applications, and this set is constantly evolving, it is useful to characterise these into groups. The figure below provides examples of digital technologies, products and services across four main groups: automation & production, artificial intelligence, data management and communications.

As a result of the explosion of these digital technologies and the manner in which they are interconnected, an exponentially growing volume of data has become a defining characteristic of the global digital economy. The quantum of data generated by the digital economy today is difficult to comprehend, yet the world is only at the beginning stages of a data-driven global economy. The figure below shows the increase in internet protocol traffic (a good proxy for data flows) over a decade and estimates that by 2022, there will be 150 700 GB of global internet protocol traffic generated every second.

Figure 3: Growth in global internet protocol traffic



Source: UNCTAD, 2019, *Value creation and capture: implications for developing countries*, Digital Economy Report 2019

South Africa's digital economy

There is little data available to accurately quantify the size and nature of South Africa's digital economy. South Africa's official statistics do not currently separate the digital economy from the traditional economy. Although there are accurate estimates of the size and contribution of the ICT sector, the digital economy is far broader than ICT and encompasses the value added from digital providers and digital applications in almost every sector in the country.

However, anecdotal evidence suggests that South Africa's digital economy is growing significantly. Informal sources suggest that the contribution of South Africa's digital economy ranges from anywhere between 2% and 19% of GDP.¹⁰ Research by Accenture estimates that South Africa's digital economy could boost total

⁹ PwC, 2017, *Sizing the prize: What's the real value of AI for your business and how can you capitalise?* p5.

¹⁰ The then DTPS estimated South Africa's digital economy contribution to GDP to be R59 billion or 2% of GDP in a media statement (https://www.dtps.gov.za/index.php?option=com_content&view=article&id=17&catid=59&Itemid=101) whereas Yusof Seedat from Accenture Research estimates the value much higher at 19% of GDP (<https://www.bizcommunity.com/Article/196/379/156149.html>).

GDP by 3% overall, or USD 12 billion.¹¹ Statistic South Africa (StatSA) reported a 2019 GDP based on market prices of R5.1 trillion (\$330 billion) (StaSA, 2020)¹². If AI is embedded as a factor of production, Accenture estimates that South Africa could double the size of the economy 5 years earlier (Accenture, 2018)¹³.

What is clear without needing rigorous digital economy estimates is that there are areas of rapid digital economy development in parts of the economy, for example the well-developed digital banking sector and growing fintech market. However, it is also clear that this exists alongside areas of lagging digital economy development, such as the poor uptake of digital technologies among the country's SMMEs.¹⁴

This lack of parallel development and the dual economies that have developed in South Africa has meant that the digital economy has not yet made a significant impact on inclusive growth and transformation in the broader economy. As such, South Africa needs a clear and coherent action plan for harnessing the immense potential of digital economy development to both generate economic opportunities at scale and make these opportunities far more open to a broader set of South Africans.

The transformation to a digital economy is an urgent imperative for South Africa and failure to develop a clear and coherent plan to do so will further increase the digital divide and limit the potential for economic growth, job creation and transformation. This imperative has been intensified by the COVID-19 pandemic. For example, populations that are unserved or partially served by broadband cannot benefit from distance education, telecommuting, access to e-commerce or healthcare information; further increasing their vulnerability and precarity. In fact, digital inequality has been a critical determinant of survival during the pandemic. Additionally, while large enterprises benefit from access to well-established business solutions and connectivity, this is not the case for a large proportion of SMMEs who's operations may have been completely halted due to the pandemic. Furthermore, the benefits of digital infrastructure are limited to those industries that are well on their way to digital transformation.

While research on the contribution of digitisation to mitigate the impact of the pandemic is limited, emerging evidence is compelling about its positive effects. Experts predict that in the medium term, countries that have transitioned to a digital economy could mitigate up to half of the negative economic impact.¹⁵ Therefore, it is critical for South Africa to develop a digital resilience plan to address current and future pandemics. In particular, the plan should address infrastructure deployment, initiatives to address all components of the digital divide, training and stimulation of consumer apps, concurrent efforts with the private sector to stimulate the digital transformation of production, as well as initiatives to address shortfalls in government operations

An ICT and digital economy masterplan for South Africa

This Masterplan is one of a number of similar plans which are being developed for specific sectors or areas of the economy. These masterplans are intended to convene the key stakeholders across government, private sector and labour in a particular sector to identify a common development vision and agree to a shared action plan for achieving this vision. The masterplan then becomes the guiding plan setting out responsibilities and actions for each group of stakeholders.

What sets this ICT and Digital Economy Masterplan apart is the fact that the digital economy is not a sector. Rather the digital economy is transversal, impacting every sector in the economy. As such, this

¹¹ Accenture, nd, Harnessing the power of open innovation through digital collaboration, online, available: <https://www.accenture.com/za-en/insight-digital-collaboration-open-innovation-south-africa>

¹² StatSA, 2020. Stats in brief, 2020, Pretoria: Statistic South Africa.

¹³ Accenture, 2018. Creating South Africa's future workforce, Johannesburg: Accenture.

¹⁴ The Global Entrepreneurship Monitor 2017 and SME South Africa note that 45% of emerging businesses have little to no new technology orientation and 50% consider technology access a challenge to growth and have insufficient skills for use.

¹⁵ Economic impact of covid-19 on digital infrastructure. 2020. Report on Economic Experts Roundtable organised by ITU

Masterplan was developed through extensive consultations with stakeholders that are both directly involved in digital technology development *and* its applications across the economy. On the basis of this consultation, the Masterplan has been formulated by the Department of Communication and Digital Technology with its advisors Genesis Analytics and Knowledge Executive. However, the plan is both cross-governmental and tripartite in setting out shared objectives and responsibilities.

The Masterplan's vision is for all South Africans to be digitally empowered to create and participate in tech-enabled opportunities that drive inclusiveness, employment and economic transformation across our cities, towns and provinces. This vision is broken down into its composite parts:

- All South Africans, irrespective of where they live or how much they earn, can benefit from transformative technology and digital platforms that enable them to work, collaborate and participate in the global-to-local digital village
- Entrepreneurs and SMMEs can invent and create innovative products and services that solve local challenges with digital solutions that can be traded internationally to enable South Africa to rise up the value chain and gain its share of the USD12 trillion global digital economy
- Smarter cities, towns and provinces provide intelligent education, healthcare, energy, transport and citizen-centric services that meet global standards of competitiveness

Achieving this vision will require South Africa to deliver on three crucial objectives: inclusive growth, job creation and transformation. The objectives of the Masterplan were determined through a process of collaborative inputs and analysis of the role the digital economy can play in realising South Africa's development vision as set out in the National Development Plan 2030 (NDP). The NDP states that "*South Africa's principal challenge is to roll back poverty and inequality. Raising living standards to the minimum level proposed in the plan will involve a combination of increasing employment, higher incomes through productivity growth, a social wage and good-quality public services. All of these challenges are interlinked. Improved education, for example, will lead to higher employment earnings, while rapid economic growth will broaden opportunities for all and generate the resources required to improve education*".¹⁶

Given that the sector masterplans are principally industrialisation plans, the focus of this Masterplan is on the NDP objectives of increasing employment and productivity growth in a way that transforms the structure of the digital economy to be more inclusive and equal. Although government digitization holds massive potential for improving the quality and sustainability of public service delivery, this plan considers this process from its industrial policy lens of stimulating local demand and job creation. However, the provisions set out in this plan will have an important contribution to make to the accessibility and impact of social services across a range of sectors including healthcare, education, safety and many others. The specific objectives of this masterplan are detailed below and the assumptions and calculations supporting these are provided in the box that follows:

- **Inclusive growth:** the digital economy should contribute upwards of at least **R200 billion of value**, or 4.5% of GDP, to the economy each year.
- **Job creation:** the digital economy should generate upwards of at least **1 million new jobs** over the next 10 years
- **Transformation:** the digital economy should provide **re- and up-skilling opportunities to at least 500 000 South African** over the next five years and support opportunity for **2.8 million SMMEs**.

¹⁶ National Planning Commission, nd, Our future – make it work, *National Development Plan 2030*, online, available: <https://www.gov.za/sites/default/files/Executive%20Summary-NDP%202030%20-%20Our%20future%20-%20make%20it%20work.pdf>

Box 1: Assumptions and calculations for Masterplan objective targets

Inclusive growth: as discussed in the previous section “South Africa’s Digital Economy”, there is currently no accurate way to estimate the size of the digital economy or its contribution to growth due to a lack of an agreed methodology and a scarcity of data. ICASA reported that in 2019 the revenue from the telecommunication sector alone was R194 billion (or 4.38% of GDP).¹⁷ This does not take into account the large contribution the digital economy is making beyond the ICT sector through the provision of digital products and services and the value unlocked through digital applications across all sectors of the economy.

Although we do not currently know the size of this value in the broader economy, a report by Accenture estimates that the digital economy will unlock R2 trillion in value across the economy over the next 10 years.¹⁸ This equates to an annual amount of R200 billion per year, or 4.5% of GDP using 2019’s GDP value of R4,428 billion.¹⁹ There are a number of unknowns which will influence this, including the impact of COVID both on South Africa’s GDP growth and the size and nature of the digital economy. However, given that South Africa’s GDP has been negatively impacted by COVID and that there has been a boost in demand for digital products and services, the objective of 4.5% of GDP contribution appears feasible and conservative in the midst of this uncertainty.

Job creation: estimates of the digital economy’s contribution to job creation are similarly frustrated by a lack of clear definitions and data, and the turbulent nature of job losses due to the COVID pandemic. It is also complicated by the lack of clarity created by job counting when considering what constitutes a job in the first place (such as whether part-time gig work is included) and whether someone moving from an existing job in the traditional economy into a new job in the digital economy constitutes “new job creation”. This Masterplan works with the evidence and research that exists to inform a view of the Masterplan’s job creation potential through the digital economy. It identifies two key areas of job growth, transformative tech applications across the economy, and digitally traded services.

Beginning with digitally traded services, the South Africa in the Digital Age initiative worked closely with the global business services sector to estimate the new job creation potential of scaled up digitally traded services in South Africa. The initiative predicted that South Africa can generate 500,000 new jobs over the next 10 years if appropriate support is given to this opportunity. These jobs are broken down into 277,398 jobs from the expansion of BPO services, 100,610 jobs from the expansion of digital and IT outsourcing, 51,758 jobs from the export of shared services (such as finance, accounting, HR and legal outsourcing), 28,832 jobs from re-shoring work that is currently being outsourced from South Africa to countries like India, and 41,403 jobs from personalised and social services (such as online language tutoring) delivered using digital technology.

Secondly transformative tech applications across the many sectors in the economy will create new forms of jobs through roles in data analysis, machine learning, AI, software development and others. Using the Accenture research²⁰ on the impact of these transformative tech applications on value addition in specific sectors, and applying the employment intensity of these sectors to the size of this value addition, Genesis Analytics calculates the potential impact of over 500 000 new jobs across these industry sectors, including over, 200 000 in financial services, approximately 90 000 in manufacturing and over 30 000 in Agriculture.

Transformation: providing accurate targets for economic transformation in the digital economy can be difficult due to the scarcity of available data. This Masterplan has focused on two areas where realistic estimates are available – the upskilling of black South Africans to be able to take up work in the digital economy, and the creation of digital opportunities for SMMEs.

Re-skilling opportunities will be provided through a number of avenues, including formally through higher education opportunities and through online learning environments. Higher education institutions remain inaccessible to most South Africans, so the estimate of interest for this Masterplan relates to reskilling through online learning environments. Here,

¹⁷ ICASA, 2020, *The State of the ICT Sector Report in South Africa*

¹⁸ Accenture (2019), *Unlocking Digital Value for business and society in South Africa updated*

¹⁹ South African Reserve Bank, 2020, *Online statistical query: Annual gross value added at factor cost (GDP)*

²⁰ Accenture (2019), *Unlocking Digital Value for business and society in South Africa updated*

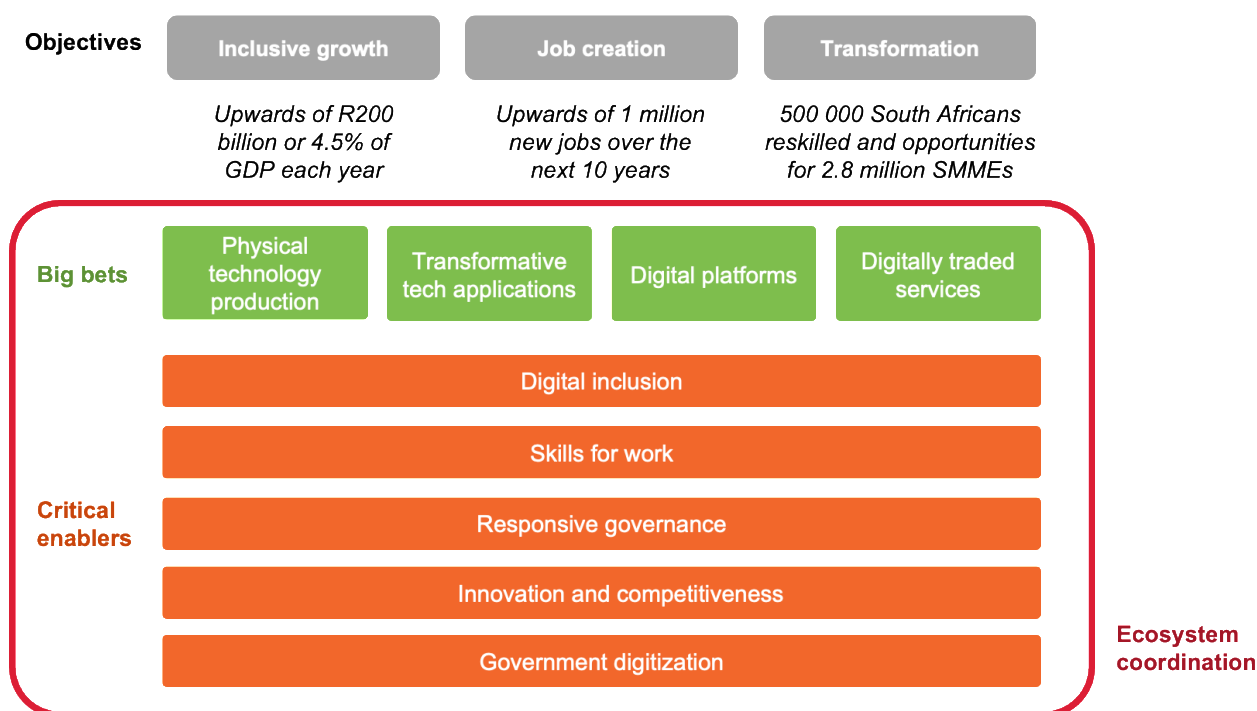
plans in the digital and IT industry to provide future skills for the anticipated growth in digital and IT export jobs include reskilling at least 500 000 disadvantaged South Africans over the next 10 years.²¹

In terms of opportunities for SMMEs, the latest estimate of the number of SMMEs active in South Africa is provided by an IFC study in 2019 which sized the SMME market in South Africa at approximately 5.7 million SMMEs. The report also details how this comprises a very diverse mix of SMMEs, with the bulk comprising very informal and micro survivalist enterprises. The Global Entrepreneurship Monitor (GEM) further estimates that roughly half emerging businesses have little to no technology orientation and 50% consider technology access a challenge to growth and have insufficient skills for use.²² This half of the SMME stock in South Africa – approximately 2.8 million – must be the target of this Masterplan to be able to accrue basic opportunities and advantages from digital technology.

The figure below sets out the key areas of opportunity and imperatives for action for South Africa to deliver the objectives and achieve the vision. To deliver the three objectives of inclusive growth, job creation and transformation, the Masterplan identifies four digital economy 'big bets' which offer the greatest chance for realizing these objectives. Five critical enablers have been identified which must be put in place for the big bets to pay off. And lastly, given the complexity of the digital economy and the many stakeholders that have a role in its development, the Masterplan provides concrete delivery mechanisms for coordinating the ecosystem of stakeholders responsible for implementing this plan.

Figure 4: ICT and Digital Economy Masterplan Framework

Our vision is for all South Africans to be digitally empowered to create and participate in tech-enabled opportunities that drive inclusiveness, employment and economic transformation across our cities, towns and provinces



Source: Genesis Analytics, 2020

²¹ Based on interviews and data provided by Business Process Enabling South Africa, 2020

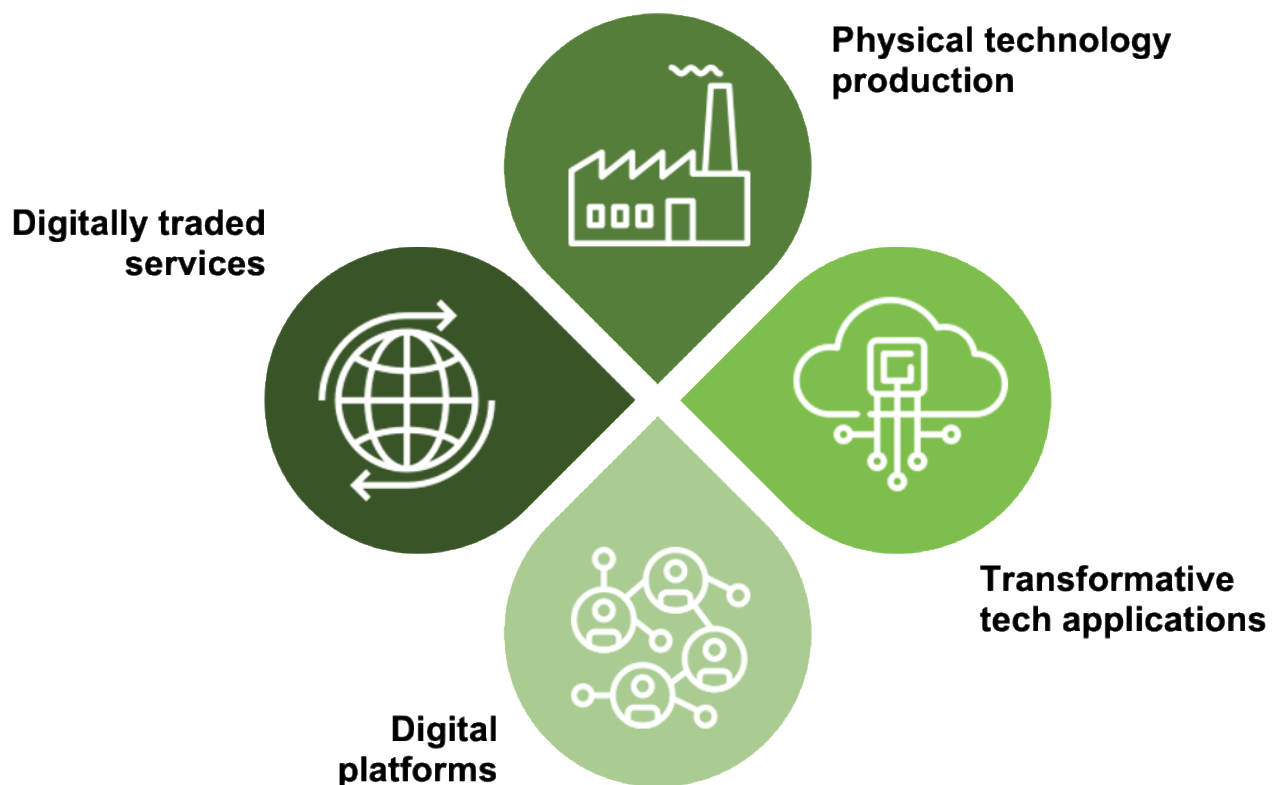
²² GEM, 2017, *A South African Perspective on Entrepreneurship*

3. DIGITAL ECONOMY BIG BETS

For South Africa to have a successful digital economy industrial policy, the country will have to place some digital economy big bets. These must be based on sound principles and evidence-based research, but also be inspired by the creative imagination of where South Africa's digital economy could be. The value of this approach is in being able to describe concrete areas of economic opportunity that are already emerging in the digital economy but have the potential to significantly scale. In doing so, this Masterplan can be much more specific about figuring out where the actual opportunities lie, and how best to support them.

However, it may be risky to do this at the level of specific firms, or even sectors, given how quickly technologies and market structures in the digital economy can shift. Rather, a digital economy industrial policy should place bets on economy-wide phenomena that impact multiple sectors. We have identified here four unfolding processes in the digital economy which offer concrete opportunities for generating inclusive growth, jobs and transformation across multiple sectors. They are shown in the diagram below and elaborated on in the sections that follow.

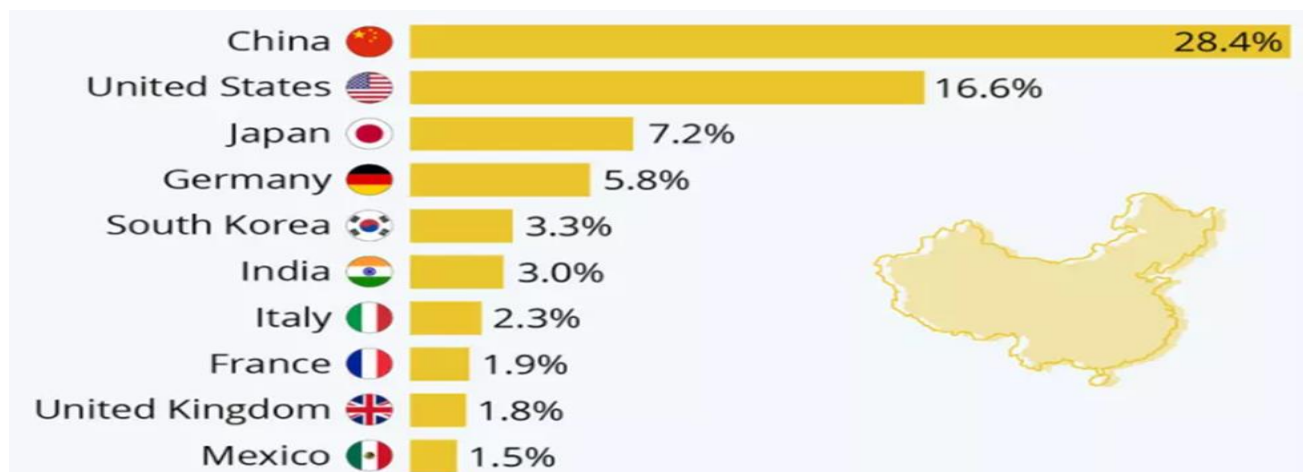
Figure 5: South Africa's digital economy big bets



3.1. Physical technology production

With the onset of the Fourth Industrial Revolution, producing the components that make up transformative technologies is rapidly becoming a lucrative opportunity for manufacturers and a promising driver of job creation. Advances and maturity in digital technologies has since opened another window of opportunity. China has placed AI at the centre of modernizing industrial activities and the economy. This has allowed China to emerge as world leader in manufacturing output. Figure 6 below shows the 2018 top ten manufacturing countries, with China close to double that of the USA and over a quarter of the world's output.

Figure 6: 2018 top ten manufacturing countries



Source: WEF (2020)²³

The World Economic Forum (WEF) identified 12 key emerging technologies, shown in the figure below, which are being increasingly deployed across the economy. In contrast with traditional production systems, new production planning and scheduling models are evolving from algorithms and automated manufacturing systems.

Figure 7: Key emerging technologies

3D printing Advances in additive manufacturing Advanced material & nanomaterials Creation of new materials and nanostructures for beneficial material properties AI & Robotics Development of machines that can substitute for humans Biotechnologies Innovations in genetic engineering, sequencing and therapeutics Energy capture, storage & transmission Breakthroughs in battery and fuel cell efficiency; renewable energy Blockchain & distributed ledger Distributed ledger technology based on cryptographic systems	Geoengineering Technological intervention in planetary systems Ubiquitous linked sensors Networked sensors to remotely connect, track, manage products, systems, and grids Neurotechnology Smart drugs, neuroimaging, and bioelectronic interfaces New computing technologies Quantum computing, biological computing or neural network processing Space technologies Microsatellites, advanced telescopes, reusable rockets, integrated rocket-jet engines Virtual and augmented realities Immersive environments, holographic readouts and digitally produced overlays
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Source: World Economic Forum *Handbook on the Fourth Industrial Revolution* (2017)

These ICT and digital technologies require the use of multiple physical components. For example, essential components for internet of things (IoT) technologies are: sensors which can measure temperature,

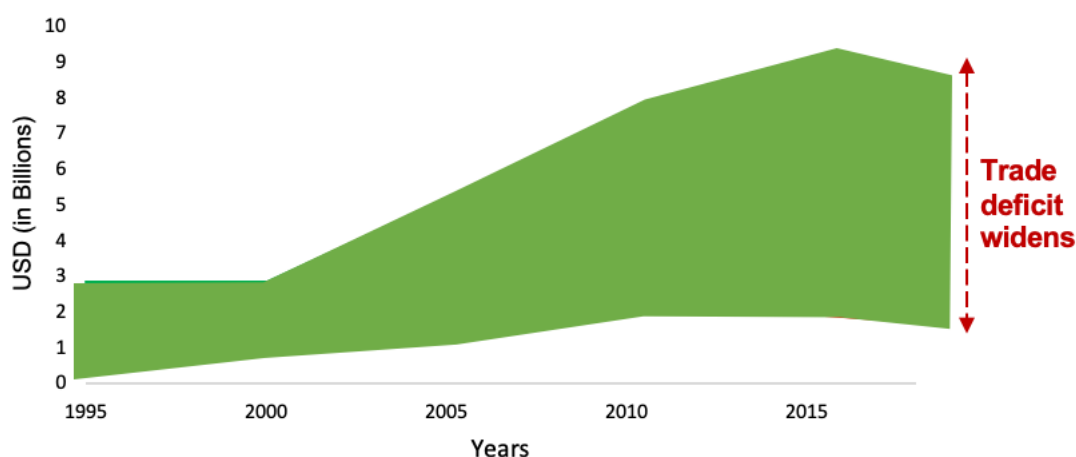
²³ There is no African country in the top ten. Covid-19 has once again shown that this a dangerous scenario for Africa. In a globalized and digital connected society, where people and goods move easily from all corners, the spread of diseases is much easier and quicker. Of course, the launch of the African Continental Free Trade Area (AfCFTA) on 1 January 2021 is a progressive step for Africa. South Africa's economic recovery plan, announced by President on 15th October 2020, includes industrial growth among the key interventions.

motion, light, humidity and pressure; chips or boards like Arduino Uno²⁴ and other microcontrollers; routers and communication modules; and, a power source for the smart device. All of these components can be manufactured locally in South Africa as demand for these components is set to grow.

At present, radio, telecommunications technologies as well as high quality electronics manufacturing and ‘micro-tronics’²⁵ are already being produced at volumes of several thousand products per day.²⁶ The country has industrial capacity in certain sectors as it was ranked 60th globally in the 2018 UNIDO Competitive Industrial Performance Index.²⁷ Measuring in terms of R&D intensity, manufacturing value-added, productivity, high-tech density as well as patent activity, the Bloomberg Innovation Index ranked South Africa as 50th in 2020 gaining one place from the previous year.

While there are already areas of excellence in the production of 4IR technologies in South Africa – such as in IoT hardware - opportunities for the design and production of physical technologies in South Africa are still nascent. Overall, South Africa is a net importer of electronics to varying stages of manufacturing complexity. In 2018, South Africa exported electronics to the value of USD 1.67 billion (1.35% of total exports) but imported USD 8.16 billion (7.8% of total imports), from relatively simple insulated electrical wires to complex transmission apparatus for radio, telephone and TV.²⁸ Thus, there is existing production capability locally which can be harnessed to improve localisation of technology production to ensure a trade surplus and contribution to job creation. The World Economic Forum (WEF) ranked South Africa 45/100 on structure of production, 45/100 on drivers of production, and 85/100 on adoption of information and communication technologies (4IR SA, 2019; WEF, 2018).²⁹

Figure 8: Imports and exports of electronics for South Africa



Source: United Nations Statistical Division, Comtrade Data. 2018.

The South African manufacturing sector, historically, has struggled due to its constrained domestic market which inhibited economies of scale, coupled with limited access to export markets. The National Advisory Council on Innovation (NACI) reported that South Africa “lost its competitive advantage in terms of medium-technology exports when compared to the average of other middle-income countries” (NACI, 2019). (NACI, 2019)³⁰. Moreover, the low high-technology export, as a share of manufactured exports, at 5.2% compared to both China and South Korea at above 30% is reflected by South Africans contributing only 10.8%

²⁴ The Arduino Uno is an example of an open-source microcontroller board that can interface with other expansion boards or circuits

²⁵ Small or nano-electronics like microchips

²⁶ Based on interview with Jack Radmore, Energy Programme Manager at GreenCape, 2020.

²⁷ UNIDO. Competitive Industrial Performance Report 2018. Available online: <https://www.unido.org/sites/default/files/files/2019-05/CIP.pdf>

²⁸ United Nations Statistical Division, Comtrade Data. Available online: <https://comtrade.un.org/>

²⁹ WEF, 2018. The Readiness for the Future of Production Report 2018, Geneva: World Economic Forum.

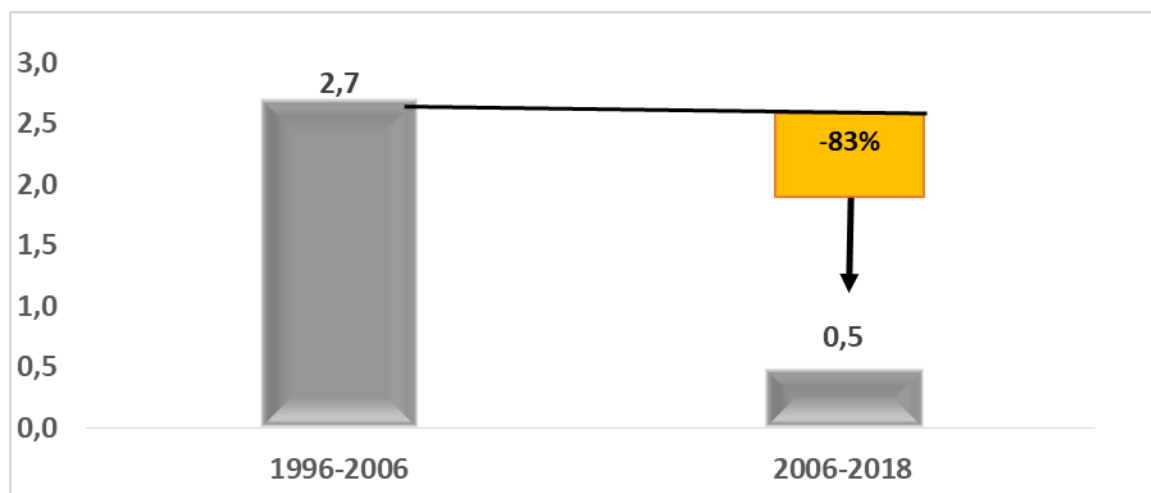
³⁰ NACI, 2019. South African STI indicators, Pretoria: National Advisory Council on Innovation.

of patents registered in 2017 (NACI, 2020)³¹. However, 4IR technologies are cheaper to produce than traditional goods overcoming economies of scale constraints.³² Cost points have fallen by a factor of ten to one hundred. There are other benefits to localisation of technology production including decreased expenditure on licensing of foreign technologies.

Production of hardware components remains labour intensive and thus the sector is labour absorptive. Despite concerns around automation and job loss, diffusion of robots has been relatively slow due to significant capital investments and requirement of reliable power infrastructure.³³ Robotic production is only economically feasible under specific conditions, for now. Certain sectors, such as electronics, are more vulnerable to automation, but this is also offset by consumer demand for rapid innovative product development in this sector.³⁴

The sector also offers significant opportunity for transformation. New entrants to the sector can overcome incumbent corporates who have been slow-moving to adapt to new technology, particularly with appropriate incentives and support from government.³⁵ South Africa's manufacturing sector has undergone shifts over the last few years. The Economic Complexity Index (ECI) has seen South Africa drop from rank 38th globally in 1995 to 69th globally in 2018. The shifts in the manufacturing sector is also characterised by deceleration in productivity growth rates as shown in the figure below:

Figure 9: South Africa's productivity growth rate (Period 1996-2006 & 2006-2018)



Source: Magwentshu, et al. (2019)³⁶

However, South Africa still retains its predominance on the African continent. The African Continental Free Trade Agreement presents itself as an opportunity for South Africa to become the largest exporter of technology in the region.

Key opportunities in physical technology production

South Africa can leverage its existing areas of competitive advantage in manufacturing and develop emerging areas with the potential for scale. South Africa's current areas of competitive advantage range from silicone processing for fibre optics, integrated circuits, solar, set top boxes, low-cost tablets and phones to

³¹ NACI, 2020. South African STI report, Pretoria: National Advisory Council on Innovation.

³² From discussion with Roger Hislop, Executive Head of the South African IoT Council, 2020.

³³ Andreoni, 2019. 'A revolution in the making? Challenges and opportunities of digital production technologies for developing countries.' UNIDO.

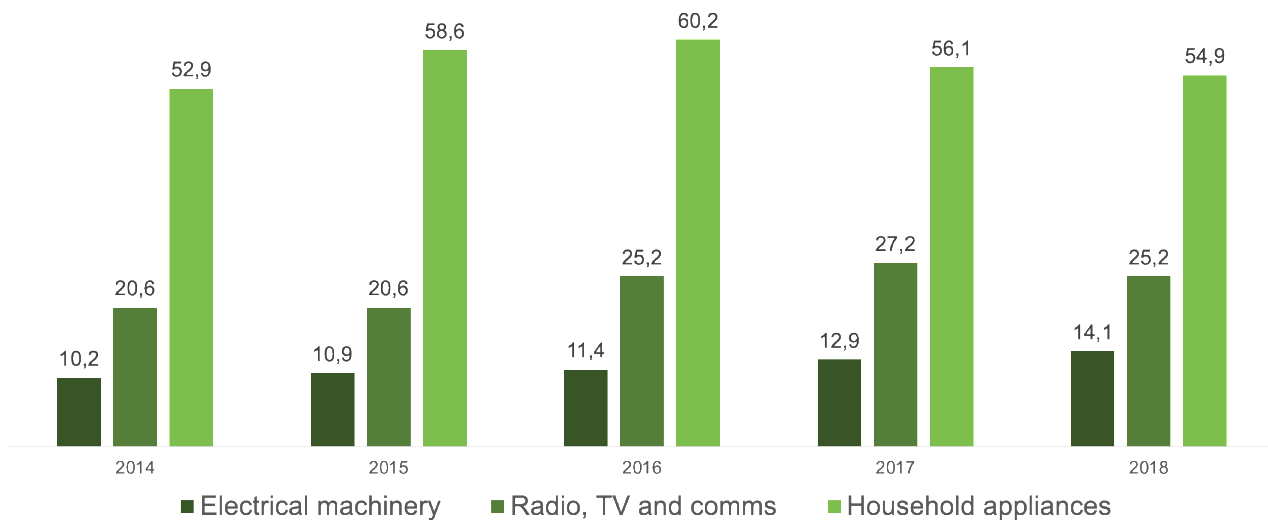
³⁴ Ibid.

³⁵ Altringer, 'A New Model for Innovation in Big Companies', Harvard Business Review. 2013.

³⁶ Magwentshu, N., Rajagopaul, A., Chui, M. & Singh, A., 2019. The future of work in South Africa, Johannesburg: McKinsey & Company.

automotives.³⁷ This includes the Mara smartphone manufacturing facility at the Dube Trade Port special economic zone in Durban, the Yekani Manufacturing facility in the Eastern Cape which produces TV decoders, and a number of facilities in the Atlantis SEZ in the Western Cape. The graph below provides the breakdown of South Africa's electronics manufacturing output over the last few years.

Figure 10: South Africa's electronics manufacturing output (Rbn) 2014-2018



Source: InvestSA, 2020, *Investing in South Africa's Electronics Sector*

In addition to traditional electronics manufacturing, the IoT industry presents a growing opportunity for local productions of sensors to fill a rising demand for IoT applications across the economy. In 2018, an IoT Council with founding members that include Internet Solutions, Nerospec IOT, Real Telematics Systems, Sqwidnet, Activate Group, Comsol Networks, CST Electronics, Dimension Data, Eseye, Macrocomm, Microsoft, MTN, Software AG and Vodacom was established. The IoT council's establishment shows a sector that is rapidly growing and organising itself. These opportunities are discussed in more detail below.

Sensors and smart devices

South Africa already has significant global competitiveness in trackers including cars, pets and wildlife (particularly to deter poachers) with several local operations. Car tracking entails in-vehicle hardware and software services using telematics.³⁸ Recently, weapons tracking has also been shown to be a potential area of expertise in South Africa, with sensors able to detect if a firearm is discharged, the location of the dischargement, and how many shots were fired.³⁹

³⁷ From discussion with the Black Business Council, 2020.

³⁸ A notable example is MiX Telematics, a leading South African fleet and mobile asset management firm.

³⁹ Nerospec Tactical produces the IRIS system with these capabilities.

Case study 1: Lightware, producers of Lidar

Lidar, which stands for light detection and ranging, is a remote sensing technology that uses lasers to measure distance. Lidar is a technology critical for use in drone-based aerial surveys, collision avoidance for autonomous vehicles (AV), and in drone avionics that enable precision landing - thus lending it particularly well to the infrastructure, agriculture, transport and security industries. This technology also undergirds drone-based delivery systems to transport food and other goods like medical supplies. Given the small size of each unit, shipping is inexpensive and easy. South Africa has significant and highly competitive local capacity in Lidar through manufacturers Lightware, producing in excess of 30 000 units annually, with significant further capacity.⁴⁰ Moreover, the firm serves an entirely international market with huge growth potential that is closely linked to the growth of the AV and drone markets. At present, China is the world's largest market for drones with an expected 40% annual growth rate from 2020-2025 suggesting a comparative if not greater increase in demand for Lidar is upcoming.⁴¹

In 2018, South Africa imported USD 8.16 billion worth of electronics from wires, phones, tablets and laptops. For domestic producers, even an increase in market share to serve an additional 10% of that demand can create an opportunity of USD 816 million. The vast majority of electronics producers are based in Gauteng, Western Cape and Kwa-Zulu Natal with the greater proportion of exports originating from the Western Cape. Producers are not at their maximum capability of manufacturing, matching increasing demand with greater capacity. Moreover, South African producers have not yet attained market presence in foreign markets, significant work still needs to be done to promote South African goods internationally.

Smart meters, grids, utilities and renewable solutions

There is significant opportunity in smart utilities with constant innovation.⁴² Smart energy management allows for mapping of company location, load shedding prediction, power quality and load switching live data, as well as a smart network that has multiple roots that provide energy to specific points. If a particular root is switched off, power can 'go around' another line. In other words, a smart grid can also function as a virtual mesh linking into the IoT space.

Moreover, the supply-side market has significant constraints with less than 2% success rate for customers going onto lead contract: which suggests the market is still reliant on traditional power suppliers. The lead time for less than 1kW systems for homes and factories is very similar. However, the trend thus far has been that the market is increasingly focused on distributed utilities and generation. This will be enabled through virtual metering. Virtual metering can track generation and feedback into the grid, which will enable independent power producers as it will be possible to monitor, pay and charge producers for their production and consumption of utilities.

On the demand-side, with load shedding to continue for additional years, there is demand from Eskom to account for energy consumption. Through smart utilities it becomes possible for an individual or an enterprise to account for their demand which may allow them to prove that they are exempt from load shedding,

⁴⁰ From discussion with Mike Mundy from Lightware, 2020.

⁴¹ Reuters, 2017. 'China's drone market to be worth \$9 billion by 2020: industry ministry'. Available online: <https://www.reuters.com/article/us-china-drones/chinas-drone-market-to-be-worth-9-billion-by-2020-industry-ministry-idUSKBN1EG0MX>. China State Council. A New Generation Artificial Intelligence Development Plan, 2017. Available online: <https://d1y8sb8igg2f8e.cloudfront.net/documents/translation-fulltext-8.1.17.pdf>

⁴² In 2016, SA developed its first smart metering specification for advanced metering infrastructure called NRS049.⁴² NRS049 presents an "open standard" reference architecture, which means that each entity within the metering system presents a standard interface and a standard semantic. Utilities are thus in a position to optionally and selectively specify any part of the system, or an integration of selected parts into sub-systems, while still adhering to the standard interfaces. The NRS049 can be taken to a distribution facility and is affordable to install. It is possible to manufacture smart metres for less than R1000. The metres can be used for bidirectional TSM metres and communication over power lines is possible allowing the use of existing embedded infrastructure rather than additional expensive infrastructure investment. This means there is a lot of potential for use in embedded generation and, in particular, load management.

this is applicable in particular for large companies such as mining houses whose demand is significant. This can create a more responsive energy management system where companies can reduce demand according to load shedding requirements.

There are several companies based in Cape Town's Atlantis SEZ that have capabilities in these technologies that can be scaled up significantly. Small scale embedded generation, solar panels, and nano grids are being manufactured locally with about two companies⁴³ importing and assembling cells and other parts. The market is constrained by a lack of scale. Micro utilities and nano grid technologies are also being produced by companies like iShack and BBox. Innovations extend beyond electrical opportunities. There is an innovative model for LPG gas that has been developed called PayGas which uses an integrated online platform where a customer can buy R10 worth of gas which distributes exactly that amount into the canister.

Production must be scaled for these opportunities through incentives, resolution of regulatory barriers and enabling policies. The business case for these technologies is strong enough but the onus is on government to take a clear stance on renewable energy in South Africa, through a committed timeline for new generation capacity.

Case study 2: An example of South African technology production

A South African switchgear and LED lighting manufacturer employs 12 000 and manufacture over 12 million products per year. They have extensive workforce manufacturing and assembly line transitions. At present, they are designing smart devices that use IoT and existing radio link connections, to create smart water meters, electrical switch gears and smart lighting for manufacture. They have achieved this working off the base of industrial capacity in 'dumb devices.'

Additive material manufacturing

Additive manufacturing or 3D printing can create, as a process, optimum materials and components that cannot easily be made using traditional methods. It links closely to the plastics and metal industries which are widely known as a root industries for production of 4IR technologies. These industries have linkages to many other industries, such as chemicals, in which South Africa already has significant industrial capacity and competitiveness.⁴⁴ Plastic and metal products are used as components for other products – such as automotive components or medical devices - and are a critical input for 3D printing, rapid prototyping capabilities and tool making for use in production. Additive manufacturing can increase customisation and produce lighter, more complex materials. This can reduce product development times and market cycles with lower cost and higher production speeds.⁴⁵

The South African plastic and metal industries have seen significant deindustrialisation as a result of increased imports and a loss of competitiveness. For example, this has caused the plastic industry to shed more than a quarter of its jobs in 2016 alone.⁴⁶ Still, the plastic sector comprised about 6% of total exports in 2018 and accounted for 17% of total manufacturing GDP.⁴⁷ While thermoplastics and low performance plastics were produced locally, high performance plastics that are used in 3D printing applications remained rare. There is therefore a large opportunity for South Africa to grow its ailing plastics and metal industries by increasing local production of high-quality plastic and metal inputs to additive manufacturing processes as demand for these solutions grow.

⁴³ These companies are Art Solar and HB Helios.

⁴⁴ Mondliwa, P. and Monaco, L. 2019. *Digital Transformation of the Plastic Products Factory* Industrial Development Think Tank.

⁴⁵ Ibid.

⁴⁶ Ibid.

⁴⁷ Statistics South Africa, 2018.

Electric vehicles

South Africa has been a forerunner in the EV space (as shown in Case Study 3, below) but the gains have yet to be captured. The traditional vehicle industry has remained dominant. South Africa's automotive industry serves the domestic market but also services international markets, like the European Union and the US. In 2020, the National Association for Automotive Manufacturers South Africa reported that the automotive industry contributes 6.4% to GDP with 4% to manufacturing and 2.4% to retail.⁴⁸ Revenues amounted to R500 billion. In 2019, the export of components reached a record R201.7 billion which was 15.5% of South Africa's total exports. The industry also makes up 27.6% of South Africa's total manufacturing output, directly employing 110 000 people and an additional 457 000 people across the economy.⁴⁹ The industry is still based on internal combustion engine (ICE) technologies, however due to changing environmental standards that urge climate-neutrality to tackle climate change, many countries are phasing out ICE technologies. Several EU countries, like France, the United Kingdom, the Netherlands and Denmark are planning to phase out ICE by 2030.⁵⁰ This creates significant risk of disruption for South Africa's automotive industry and is a threat to GDP, local jobs and foreign exchange. Immediate action must be taken to prevent a significant blow to the manufacturing sector and the country at large.

There is still significant activity in the EV sector. uYilo e-Mobility Programme was established in 2013 through the Technology Innovation Agency to enable electric mobility in SA. uYilo supports expertise creation in battery testing, material testing, vehicle systems, and a smart grid ecosystem. The ecosystem is used as a live testing environment for interoperability of the system components of the smart grid. The technology value chain begins from renewable generation, second-life EV batteries integrated as stationary storage, vehicle-to-grid of ancillary grid services from EVs and autonomous energy management for charging EVs.

In addition, South Africa could consider the low-cost two-wheeler market. In developing markets, particularly in parts of Africa like Uganda, electric two wheelers are set to boom. While uptake is low in South Africa, the wider African market may become the 2nd largest market after Asia for these vehicles.⁵¹ It may be critical to invest in serving these markets as early as possible.

The prudent strategy to realise this opportunity is to begin to orientate automotive manufacturing towards the EV space. South Africa's existing capabilities in energy storage, lithium ion batteries, EV charging and battery management must be further commercialised. This is not just a production opportunity but also a means to ensure that the economy of South Africa is greener and more environmentally sustainable. EVs can contribute to reduced air pollution and CO2 emissions, provided South Africa moves away from coal-based power. That said, the advent of smart grids can be an offset for increased power generation.⁵²

Case study 3: Joule & Mellowcabs

In 2008, South Africa had four Joule electric vehicle (EV) prototypes that was touted at R300 000 and won international awards. The cars were showcased alongside Nissan's Nuvu concept EV which became the Nissan Leaf one of the world's top selling plug-in electric cars with global sales of over 300 000 units in 2018.⁵³ On the other hand, the company that produced the Joules, Optimal Energy, was shut down in 2012 after R300 million rand was invested as it was believed that it was too expensive to commercialise. Today, EV market

⁴⁸ NAAMSA, 'South Africa Automotive Industry Sales Statistics', 2020. Available online: <https://www.naamsa.co.za/SalesStats>

⁴⁹ Ibid.

⁵⁰ Reuters. 'Denmark calls for EU strategy to phase out diesel and petrol cars from 2030', 2019. Available online: <https://www.reuters.com/article/us-eu-autos-denmark/denmark-calls-for-eu-strategy-to-phase-out-diesel-and-petrol-cars-from-2030-idUSKBN1WJ1YW>

⁵¹ Black, A. 'Industrial Development Think Tank Policy Brief 11: Managing the Transition to Electric Vehicle Technology', 2019.

⁵² Black, A. 'Industrial Development Think Tank Policy Brief 11: Managing the Transition to Electric Vehicle Technology', 2019.

⁵³ Nissan News. 'Nissan delivers Nissan Leaf', 2018. Available online: <https://global.nissannews.com/ja-JP/releases/release-4a75570239bf1983b1e6a41b7d00d8f5-nissan-delivers-300000th-nissan-leaf?source=nng>

share is expected to grow from 2% to 22% in 2030 of world automotive sales. The market for EVs was valued at \$162.34 Billion in 2019.⁵⁴

At present, a Stellenbosch-based company called Mellowcabs is producing light electric cargo vehicles that are low cost, efficient and emission free. Given the significant increase in digitally enabled delivery services like UberEats, Deliveroo and other platforms in South Africa and the globe, there is a need to support innovators in the space to commercialise their technology to ensure South Africa's share in the global production.

Satellite and drone technology

South Africa has significant local capability in the space technologies sector, with highly competent and globally competitive space engineers. The potential for satellite technologies is significant given their wide range of applications. Satellite technology has decreased in size and efficiency: South Africa has significant capability in developing nanosatellites and small satellites, including optical payload technology that improves the power of nanosatellite resolution. These are critical in the deployment of satellite constellations that provide global satellite internet and can connect machines and systems into IoT systems to support smart cities, autonomous vehicle systems as well as other sectors like mobile banking.⁵⁵

There are various compelling strategic reasons to invest in local production of satellite technologies that extend to national security and data sovereignty concerns, but also to providing free internet access to all parts of South Africa. A sovereign satellite system can allow government to set prices for internet usage to the benefit of disadvantaged communities. Moreover, national and defence data is very sensitive, therefore using a foreign satellite is a significant security risk from a defence and commercial perspective.⁵⁶ Thus, it is a prerequisite of the success of this sector that government buys locally produced satellites. This has been a constraint to the expansion of production locally, which although small, does exist. Production is constrained by an overall lack of government support in terms of investment and procurement, contributing to brain drain and cost inflation as technology is procured from foreign suppliers.

In a positive step in the right direction, government has greenlighted the development of the Space Infrastructure Hub, a R3.1 billion project, that is expected to support 15 000 new jobs in space in the next 3 years. Further opportunities in the space technology sector are detailed in the Aerospace and Defence masterplan.⁵⁷ The Space Infrastructure Hub will allow for the development of satellite infrastructure, augmentation systems and earth observation satellites.⁵⁸

South Africa has long had locally developed drone technology for military usage. Recently, drones have transcended their military origin to become a powerful business tool. They can be used for a wide range of applications from disease control, stock-taking, photography, sport, health and even delivering pizza. South Africa's Drone Industry Council has highlighted the opportunity for this technology to be locally produced, from components to assembly.

Local manufacturers in South Africa are currently exporting high quality drones internationally and into Africa, but these opportunities require support, particularly from the government, to scale.⁵⁹ This includes provision of sites for manufacturing, funding of production, take off agreements and R&D funding for proof of concepts. Drone manufacturing can stimulate ancillary industries from payloads, data acquisition, drone

⁵⁴ Allied Market Research. Electrical and Hybrid Vehicles Market Research Report, 2020.

⁵⁵ Discussion with Jessie Ndaba and Khalid Manjoo from Astrofica, 2020.

⁵⁶ Discussion with Francois Denner Enceladus Group, 2020;

⁵⁷ Discussion with Jessie Ndaba and Khalid Manjoo from Astrofica, 2020.

⁵⁸ Business Tech, 2020. '5 major projects in the works for South Africa – including a space hub and a new city'. Available online: <https://businesstech.co.za/news/technology/410193/5-major-projects-in-the-works-for-south-africa-including-a-space-hub-and-a-new-city/>

⁵⁹ Based on workshop with Drone Council, 2020.

maintenance, components manufacturing and sensors. It is worth noting here that the Council for Non-Proliferation of Weapons of Mass Destruction have regulations applicable to drone manufacturing that will need to be reviewed, and the Council consulted to ensure that commercial drones may be manufactured and sold freely.

How South Africa can win in physical technology production

The previous sections have demonstrated local innovation and capacity, and elucidated the benefits of local technology production, however production is nowhere near its potential and systems to support its development are still immature or barriers to growth still exist. For these opportunities to be unlocked, well considered industrial strategy and policy is critical. The recommendations below relate to supporting the scaling of physical technology production and are described more fully in the critical enablers discussion in Section 4.

To support the competitiveness and scaling of nascent local production activities:

- **Utilise and scale up existing incentive packages for the ICT industry** that will encourage manufacturing, particularly labour-intensive manufacturing, of electronics in South Africa, such as low-cost tablets and smartphones and autonomous vehicles such as drones. This will support nascent emerging firms to be able to scale and become more globally competitive.

To improve domestic demand for physical technology production:

- **Creating incentives and an enabling environment for the establishment and expansion for data centres** based in South Africa that can service local and regional demand. This will establish strong local demand for the physical technology components and requirements of growing data centres.
- **Provide a tablet to every school student in need** so that they can access online educational content at school and when learning from home during the COVID-19 pandemic. This national roll out of devices can be done through local procurement and provide an opportunity to kickstart local electronics production or assembly.
- **Provide performance incentives for local procurement of ICT tools, software and devices** to government agencies and departments. The process of government digitization represents an enormous source of demand for physical ICT and digital technologies which can be sourced locally.
- **Develop a central ICT government procurement system** to manage technical scoping of required digital and ICT support within government.
- **Develop an ICT payment monitoring system** to ensure that government contracts to SMMEs are paid on time and without irregular spending.

3.2. Transformative tech applications

The application of transformative technologies in specific domains (industry verticals) contributes to a vibrant digital economy. The process of research and development to commercialisation and scaling of transformative tech applications into local and global markets from a South African base can support growth, job creation and transformation. The last decade has illustrated how consumer-facing industries have been reconfigured by digital applications. We should expect that primary industries such as mining and agriculture, and many business-to-business industries, will be similarly transformed. Digitally enabled firms are reshaping markets, improving customer experiences and capturing significant value. It is not irrelevant where these businesses are based. If South Africa is to gain the full benefit of the digital revolution, we should welcome

global players and encourage them to locate value-adding activities in South Africa. The application of transformative tech is depicted in the below table.

Transformative technology	Transformative tech application	Sector/domain
Robotics	Automated robotic bricklaying machine that can make more than 2,000 interlocking building blocks per day	Manufacturing
Augmented reality	Starbucks uses augmented mobile phone reality that provides digital experiences to customers while ordering coffee in store	Retail
IoT & drones	Monitor and predict agriculture and environmental patterns	Agriculture
Robotics	Robo-advisory services to provide automated investment advice and portfolio management for wealth management services.	Finance
Blockchain	Tracking the origins of ore and metal	Mining

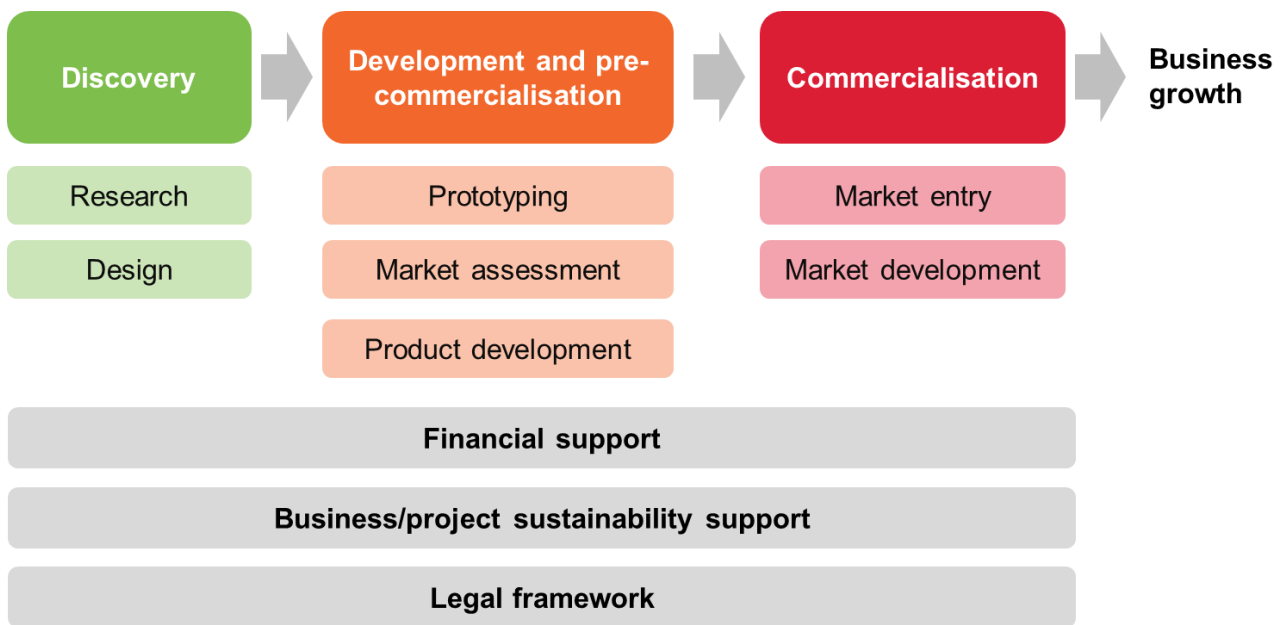
It is also critical for South Africa to build its own digital businesses and to do so at a far larger scale.

Through such businesses, South Africa can digitally shape and contribute, not only absorb and receive. South African businesses, and their owners and tech mavens, add far more than a welcome tax base. Evidence shows that when digital businesses are developed here, they tend to locate their back offices and key activities here, creating opportunities for a wide range of skills.⁶⁰ Their presence has a powerful spillover effect, encouraging further innovation, beneficial competition and more start-ups.

In addition to becoming a market leader in the production of various physical technologies, South Africa also has the opportunity to apply these technologies across various economic domains. The domestic demand for transformative tech applications in these domains can be leveraged to first establish a proof of concept for scaling into the region and global markets. The development and adoption of transformative tech applications across the economy will require a pipeline of activities. This entails the full value chain of developing and commercialising transformative tech applications. It begins with research and development (R&D) of the tech applications among universities, science councils or private companies. This is followed by commercialisation and scaling, which is often undertaken by start-ups or established firms. A process of connecting these firms to sources of demand and financing is important for the sustainability of these businesses. These sources of demand span government and enterprises in both local and global markets. This development process is captured below.

⁶⁰ WNS SA, (2016), *SA's business process services exports gaining global share*, IT WEB, online, available: <https://www.itweb.co.za/content/JKjlyrvwNr1qk6am>; Also see Deloitte,(2016), *South Africa's Outsourcing Hotspot Trio*, p6.

Figure 11: Process of transformative tech application development



Source: Adapted from the Technology Innovation Agency Annual Performance Plan 2020/2021

Key opportunities in transformative tech applications

The application of digital foundations is already evident across various domains of the economy.

- In **mining** for example, the application of AI and machine learning is applied in optimising mining and mechanistic processes. Digital mining is particularly prominent in Mpumalanga where the integration of AI, IoT, machine learning and software analytics have been applied to create a “digital twin” i.e. a virtual replication of physical assets. This digital mine - Exxaro Belfast coal mine - is the first of its kind for the mining industry in South Africa.⁶¹ The digital twin enables better planning and simulations in order to achieve better approaches to mining, realising better outcomes and safety measures for its workers.
- Various domains in the **manufacturing** sector have adopted technology to improve production processes over the last decade. These instances include **utilities**, where Eskom developed a smart strategy to be adopted in phases. This will involve the application of an IoT system in relation to solar energy customers to assist in delivering energy according to the demand of its customers, while increasing efficiency. Moreover, municipalities have seen an increase in the procurement and installation of smart meters.⁶² Other applications of digital tools includes working towards establishing the use of tools and technologies in the **construction** domain, and in particular working towards smart city frameworks through the digitisation of building plans and processes. One such example is the Building Information Modelling (BIM) Institute of South Africa, which is working towards the national rollout of BIM in the construction sector. Its ultimate goal is promoting the use of technology as an enabler to increase quality and productivity of construction.⁶³
- **Financial services** in South Africa is amongst the most sophisticated in the world. This covers the emergence of fintech and insurtech⁶⁴ driven by AI technology and machine learning. Financial services also make use of blockchain technology which facilitates record keeping of transactions and the creation of

⁶¹ Exxaro website, *Delivering a digital twin to South Africa*, 2018

⁶² Gauteng Department of Economic Development, 2020, *Gauteng Digital and ICT Market Quantification Report*, p122

⁶³ Building Information Modelling, 2020, online, available: <https://www.biminstitute.org.za/>. Also see Gauteng Department of Economic Development, 2020, *Gauteng Digital and ICT Market Quantification Report*, p123

⁶⁴ This refers to insurance services provided solely online enabled by mobile devices and underpinned by an AI platform. See Pineapple and Granadilla

digital identities and has also been utilised in relation to an interbank settlement system, endorsed by the Reserve Bank.⁶⁵

- Edutech represents one of the biggest opportunities for growth in areas such as web-based learning, virtual teaching and content and course curricula development. The shift to accessing education resources online has become more relevant for **Education** in South Africa today. As such, investments by the government has sought to increase the roll-out of e-learning solutions.

In order for South Africa to support the process of developing and adopting transformative tech applications, it is essential to identify the domains with the greatest opportunity to scale. This Masterplan provides, in more detail, a strategic selection of domains where this process of applying transformative technology to develop digital business models holds promise. This is based on several factors including our historical economic activities (encompassing well and poor performing sectors), our current capabilities, competition in the global market, and more recently, the current economic environment with respect to the COVID-19 pandemic. This is detailed more fully in the Appendix to this Masterplan. For example, China has placed AI as a strategic imperative technology to drive several applications in digital services (Lundvall, 2021)⁶⁶. These applications are in basic service delivery, health, education, security, to mention a few. In their drive to achieve a Smart Nation, Singapore set out to train all public officers in basic digital literacy, 20 000 in data analytics and data science, and all ministries to adopt AI in service delivery or policy making by 2023 (Smart Nation Digital Government Group, 2018)⁶⁷.

The Masterplan identifies and explores two examples of high potential which are indicative of the many domains where transformative tech applications can unlock value. These areas are healthcare and agriculture - already defined as a priority in the Department of Science and Innovation's (DSI) bio-economy policy particularly relevant to addressing the COVID-19 pandemic. The illustration of the process of R&D, commercialisation and scaling these two domains are, however, equally applicable in other sectors i.e. financial services, mining, manufacturing and many others, as previously described. As transformative tech applications are relevant for all industries, the Masterplan will identify actions that will enable all of these domain applications to be developed. However, as a starting point, the Masterplan specifically addresses agriculture, including forestry, and healthcare.

Agriculture

Digital application opportunities in agriculture have largely resided with commercial farmers who have the capacity to adopt new technologies, however this is not the case for small-scale farmers. Digital agriculture solutions can support the scaling of emerging farmers to formal commercial farming operations by supporting the path to commercialisation. This is critical for addressing the inequality challenge in this sector. The Masterplan focuses on various opportunities to assist small-scale and emerging farmers in agriculture, including forestry, to commercialise using transformative tech. We note that large-scale commercial farming is already transforming the commercial farming sector by enabling precision agriculture.

Precision agriculture applications provide farmers with precise information for efficient food production and better management of farms, crops and herds. South Africa is seeing a higher application of precision farming, both for larger commercial farmers and smaller emerging farmers. This is because it is a highly economical farming and tech solution. Outcomes of precision farming relate to detection of harmful pests and diseases as well as arable land for growth of produce.⁶⁸ In addition, it can measure and optimise the use of

⁶⁵ Gauteng Department of Economic Development, 2020, *Gauteng Digital and ICT Market Quantification Report*, p152

⁶⁶ Lundvall, B.-Å., 2021. Freeman on innovation for economic development. s.l., s.n.

⁶⁷ Smart Nation Digital Government Group, 2018. Digital Government Blueprint, Singapore: Smart Nation Digital Government Group.

⁶⁸ Accenture Strategy, *Unlocking digital value in South Africa's agriculture sector*, p11.

water and irrigation.⁶⁹ Farmers therefore have the ability to access real-time information for accurate decision making.

Tech applications which enable precision farming in South Africa, such as smart agrisystems or robotics, enabled by AI, present an opportunity to scale to and beyond the region. An example of this is a start-up known as Aerobotics detailed in the case study below.⁷⁰

Case study 4: Aerobotics precision agriculture solution

Aerobotics, a start-up, is an example of the use of satellite imagery to assist farmers with insights to better manage their farms. Aerobotics' main IP is its AI platform which has enabled it to scale and function globally in 18 different countries, including its biggest market in the U.S. Aerobotics does not buy drones nor train pilots in any of their global countries. It rather, has developed drone pilot networks making it scalable and enabling it to operate in other countries. Once the data has been captured, it is processed in the cloud using Amazon cloud services and the client can access the results anywhere in the world.

Linkages to retail markets are crucial for the growth and sustainability of small-scale farmers. This relates to reliable access to off-takers such as grocery chains. While commercial farmers can rely on established links to off-takers, smaller farmers do not have constant supply contracts and rely on the fresh markets to sell their produce. Tech solutions that assist in providing smaller farmers with access to market can accelerate the path to commercialisation. Currently, digital platforms exist that enable this process such as **HelloChoice** a platform for the trading of produce between farmers and retailers; and **SwiftVee**, a platform that facilitates the auctioning and selling of livestock to buyers. In addition, the Khula app provides smallholder farmers with access to warehouse management facilities and on-selling of farm products to consumers through an ecommerce platform. This provides consumers who demand and value foods organically grown by small-scale businesses with an efficient way to access them.

An additional area of opportunity also lies in the traceability of supply chains, important for the tracking of livestock from birth.⁷¹ Small-holder livestock farmers can benefit from the use of drones and blockchains for example, for traceability, in order to manage and track communicable diseases as well as managing theft.⁷²

South Africa lacks a national biosecurity and crop protection system to prevent destruction of agricultural assets. This presents an opportunity to build a single national detection and diagnosis system for pests and climate events like drought. Once developed, this system should be made accessible to small-scale farmers in particular in order to provide open access to information on biosecurity risks which commercial farmers can typically pay for.

Agro-processing is the processing and transformation of agricultural produce. It has two important linkages, the first is to the agriculture sector and the second to the manufacturing sector. For this reason, it has been identified as a key growth area in South Africa by the Gauteng Department of Agriculture and Rural Development (GDARD). There is opportunity in agro-processing to apply IoT enabled smart farming tools to accelerate agro-processing mechanistic activities by improving its productivity throughout the value chain. In addition, the dtic has identified key investment opportunities in agro-processing such as food processing in the milling industry. Supporting smaller-farmers with the required production inputs and infrastructure, enables smaller farmers to benefit from such opportunities. Similarly, GDARD has established such support for small-scale farmers which encourages participation in the agro-food value chain.⁷³

⁶⁹ Gauteng Department of Economic Development, 2020, *Gauteng Digital and ICT Market Quantification Report*, p148

⁷⁰ Based on interview with Timothy Willis, 2020, COO of Aerobotics.

⁷¹ A more sustainable system beyond "tagging" will need to be developed. This has been acknowledged by the TIA and work is being done towards the development of such a system.

⁷² Gauteng Department of Economic Development, 2020, *Gauteng Digital and ICT Market Quantification Report*, p156

⁷³ Gauteng Department of Economic Development, 2020, *Gauteng Digital and ICT Market Quantification Report*, p157

The forestry industry is also evidencing the gains to small-scale farmers. The opportunity in forestry pertains to assisting small-scale farmers in adhering to certification standards set by The Forest Stewardship Council (FSC). The FSC certification has become the world's leading scheme for promoting sustainable forest management, with a strong focus on mobilising consumers through its chain of custody and labelling schemes. Certification in accordance with such standards is important for smallholder farmers as it affects their ability to successfully sell products in the marketplace. In this regard, an organisation known as the **CMO Group** has created a unique digital solution that enables smallholder farmers to sell their produce, described below.

Case study 5: CMO integrated forest management system

CMO has established several FSC Group Schemes over the last two years for the certification of all forest related products. Community based farmers are able to subscribe to the scheme, in order to receive support in attaining as well as maintaining certification for their goods. These products are sold through an online marketplace, connecting sellers to potential buyers, based on CMO's established network. This is facilitated by an **application** built by CMO known as the **integrated forest management system** ("IFMS"). Encompassed in the app solution is the handling of certification requirements, forest management plans and in-field data capturing as well as reporting. The value proposition created for smallholder farmers is the ability to get value for their products by ensuring that they are able to farm according to FSC standards, but also using the application to improve their management techniques and thus produce superior products for the market.

CMO has been able to scale its technology to the region and beyond having conducted pilots in Uganda, Thailand and Namibia in addition to its hub in South Africa, with plans to develop an online market place for deployment in a number of countries. This includes establishing the trade and trading platforms globally where countries will have open access to certified products sold directly from a farmer in countries like South Africa or Namibia.

Healthcare

The application of transformative tech in healthcare services is occurring in pockets across South Africa, with many opportunities that have yet to be scaled. There exists the opportunity to scale more broadly and export the application of the technologies to the region and beyond. The areas of opportunities in healthcare are related to the functions of diagnostics and personal treatment, and the enabler relating to information systems which underpins these functions.

Diagnostics and treatment

AI technology is providing a means to address access to quality healthcare services and overcome challenges of capacity in public healthcare facilities. AI presents opportunities for static remote diagnostics. Diagnostic solutions include automated diagnostic support for medical imagery, e.g. tumors, blood conditions and viruses. An image is uploaded, and the application reverts back to the doctor regarding the likelihood of a serious condition. This enhances accuracy and is a cost reduction mechanism that broadens access to high quality services. Telemedicine also presents the ability for diagnostics through virtual communication. Patients can detail symptoms which is sent to an expert, who then provides diagnostic support back to the patient. Another version of telemedicine exists in India, where doctors in a centralised centre remotely diagnose and monitor patients in isolated areas that do not have access to doctors through telemetry.⁷⁴

⁷⁴ Devices which record a patient's heartrate or blood pressure for example

Discovery's telehealth application known as **Discovery Dr Connect** is an example of AI powered services, described below.

Case study 6: Discovery telehealth⁷⁵

The Dr Connect app enables a user to assess their symptoms, through an AI powered symptom checker. In addition, Dr Connect provides personalised advice and virtual interactions between patients and their doctors. It includes a global network of over 100 000 doctors across 200 countries, and 147 specialties. This is also known as telemedicine which is the remote diagnosis and treatment of patients. South Africa launched a telemedicine platform, through a partnership between Discovery and Vodacom, related to doctor to patient online consultations with respect to suspected COVID-19 cases.

Telemedicine can include the treatment of patients enabled by platforms and connected devices and the monitoring of such patients enabled by real-time sensors and wearables. Telemedicine presents opportunities to assist in improving the process of diagnosis to actual treatment. This includes making information available to healthcare professionals to facilitate the support of treatment to patients. **Vula Mobile** for example provides doctors in rural areas access to specialist's advice on how to diagnose and treat their patients. Vula Mobile has resulted in 1 in 3 patients being managed in rural areas without having to travel. A doctor or nurse is able to select a listed specialty, then the specialist will receive information as input by the healthcare profession from a referral form. Based on the information the specialist will advise the doctor on how to treat or manage the patient.

In addition to Vula Mobile, EMGuidance provides medicine information for treatment, to healthcare professionals, detailed in the case study below

Case study 7: EMGuidance digital healthcare platform

EMGuidance is digital healthcare platform used exclusively by healthcare professionals. The platform is an eco-system that brings together key clinical guidelines, medicine and practical health system information that is required by doctors, nurses and pharmacists in the public and private sector. The platform provides these healthcare professionals with medicine information, across a range of medical conditions. EMGuidance includes a two-way flow of information facilitated by chat services and a value adding digital channel for the pharmaceutical industry to connect with the healthcare professionals.

Beyond AI and telemedicine, 3D printing is being applied to automatically produce medical equipment and parts. 3D printers are a valuable addition at remote primary healthcare facilities to make needed equipment on site. Vaal University of Technology is working to apply 3D printing for the design and manufacturing of prosthetic legs. Furthermore, the University of Pretoria has used 3D printing in the case of the world's first middle-ear transplant.⁷⁶

Information systems

Information systems are a cross-cutting enabler for digital applications in healthcare. This includes the function of data collection and access, and supply chain management.

Integrated data management systems can provide full visibility of patient information for better insight at the level of both individual diagnosis and treatment, and at an aggregate level for managing

⁷⁵ Information based on interview with Derek Wilcocks, Group CIO of Discovery, also see Discover, 2020, online, available: <https://www.discovery.co.za/medical-aid/dr-connect> [Last accessed 03 April 2020] and Discovery, 2020, COVID-19, online, available: <https://www.discovery.co.za/corporate/coronavirus-covid19-disease> [Last accessed 03 April 2020]

⁷⁶ Gauteng Department of Economic Development, 2020, *Gauteng Digital and ICT Market Quantification Report*, p150

healthcare institutions. For example, Netcare is establishing a single view of a patient. This is achieved through digitised record-keeping and centralisation of all available data relating to a patient's care across its institutions and hospital departments. This provides a single source of patient health that reflects historical treatment, diagnostics, and other health indicators that can be easily accessed and used when a patient presents for care.

The Milpark Hospital has also deployed patient monitoring IoT which serves as a further source of patient data that can be integrated. Sensors that monitor blood pressure and oxygen levels for example, offer nurses and doctors real-time data on the state of a patient. These readily accessible sources can also be monitored autonomously, freeing staff to work on more complex activities and reducing paperwork. Sophisticated, integrated systems such as these require robust security protocols and measures. The monitoring of patient and IoT data across the institution can therefore support its management by identifying capacity utilisation and supporting scheduling.

Creating an environment where health data can flow easily will better enable research and analysis. Key to this is supporting interoperable data systems and that maintain data privacy. The Bioinformatic department at WITS university is supporting this process through the development of a data de-identification process. The aim of de-identification is to work towards a process and pipeline where healthcare data can be de-identified so it no longer can be re-identified, and therefore enables open data sharing.

Supply chain management is essential for the accurate and timely distribution of medical supplies. South Africa is developing a relatively sophisticated supply chain management capability. This accounts for real time monitoring of inventory and stocks, down to an institutional level, which is then operated from a central control command centre. Having visibility of institution stock levels and overlaying this with anticipated demand can support optimisation of national health inventory and resources. There is also an opportunity for support functions that enable patient services and care. This includes for example, Iyeza Health, involved in medicine delivery, further detailed below.

Case study 8: Iyeza Health

Iyeza Health delivers medication to rural economies. These services entail the collection and delivery of chronic medication. Iyeza Health addresses two problems in the supply chain management space within healthcare. First, there was a need in poorer communities in Cape Town, where patients lacked the access, finances, transport and time to collect medicine from public health facilities. The second need pertains to the capacity constraints in these facilities, to cope with the increased rate in chronic patients. Iyeza health intends to expend its supply chain service for delivery services all over South Africa.

How South Africa can win in transformative tech applications

The potential benefits associated with transformative tech applications are immense. The 2020 McKinsey Global Survey indicate that artificial intelligence (AI) adoption led to increased revenue and cost reduction (McKinsey & Company, 2020)⁷⁷. The Accenture report sees a boost in global labour productivity by 40% in 2035 due to AI (Accenture, 2018).⁷⁸ To achieve the productivity, the overall digitalization must be complimented by enhanced human skills, where 1% increase in digitalization may results in 17% increase in labour productivity (Gopane, 2020).⁷⁹

⁷⁷ McKinsey & Company, 2020. McKinsey & Company | The state of AI in 2020. [Online]. Available at: <https://www.mckinsey.com/business-functions/mckinsey-analytics/our-insights/global-survey-the-state-of-ai-in-2020> [Accessed 1 Jan 2021].

⁷⁸ Accenture, 2018. *Creating South Africa's future workforce*, Johannesburg: Accenture.

⁷⁹ opane, T., 2020. Digitalisation, Productivity, and Measurability of Digital Economy: Evidence from BRICS. *5th International Conference on Digital Economy, ICDEc 2020; Bucharest; Romania*, Volume 395, pp. 27-37.

We further summarise the key recommendations that are required to ensure the realisation of the opportunity for transformative tech applications. These are further described in the critical enabler's discussion in Section 4.

To support South African businesses to innovate, commercialise and scale transformative tech applications into global markets:

- **Map the innovation funding process for digital innovations from R&D to final launch** to understand the areas of overlap and how funding in one stage can support funding in another. This will ensure sustainability of R&D through to commercialisation.
- **Reform South Africa's IP policies and patent grant system** to be more accessible and to foster innovation, which will make the legal protection of IP more accessible to emerging innovators
- **Bolster R&D financing schemes with a centralised co-ordinating body** that encourages businesses to develop problem-solving digital solutions and ultimately export such products and services to the region and beyond.
- **Optimise existing special economic zones, innovation hubs and technology parks** to enable inclusive growth of digital businesses. This is essential to ensure smaller and emerging businesses can develop and commercialise their products and then scale into regional and global markets.

To ensure open data ecosystems and the sharing of the data necessary for many of the transformative tech applications to be impactful:

- **Development of a policy that addresses data access and sharing** to supplement the current POPI Act and PAIA. Data sharing and open data access is critical for the realisation of many transformative tech applications which rely on quality data to be impactful.

To address the requirement for a steady pipeline of skilled South Africans who can support the application of digital technologies across a variety of sectors:

- **Update the primary and secondary school curriculum** to take into account future STEM skills requirements.
- **Fund vendor-aligned curriculum for school-level early exposure** through after school programmes. With a foundation of STEM skills in place, this will be important to ensure a continuum of skills that are market related for digital application opportunities.
- **Modernise South Africa's qualifications and credentialing system** to account for new ways of learning. This would include the need to review micro-credentialing in South Africa enabling a pathway to relevant qualifications that be delivered in a short timeframe, through online platforms.

3.3. Digital platforms

Digital platforms facilitate commercial interactions between actors, destroying many of the economic barriers preventing markets from functioning optimally and generating inclusive outcomes. Digital platforms remove information asymmetries by digitally aggregating demand and supply, making buyers and sellers visible to one another and standardising prices. This makes locating customers or service providers quicker and easier with fewer transaction costs. Digital platforms also generate trust and credibility by screening buyers and sellers, and through crowdsourced rating mechanisms. This is transforming the generation of trust in markets from personal face-to-face interactions to decentralised and virtual systems. Lastly, digital platforms

can greatly improve service delivery through more efficient payment transactions and personalised services. This allows buyers to get better service for less, and for sellers to spend more time on value-creating tasks. As a business, platforms allow for the linking and facilitation of transactions between consumers and producers on a broad scale.

All of these effects result in improvements in efficiency and reductions in cost, with three important outcomes. The first is connecting sellers to new customers or suppliers. This is particularly important for informal enterprises which can typically only access resources and market participants in their immediate location. The second is unlocking latent demand for a broad suite of services, including high-skilled and low-skilled services. By unlocking latent demand for these services, the market opportunity for suppliers of these services increases. High-skilled individuals can access higher paying buyers and low and semi-skilled individuals, who represent the majority of South Africans, can earn an income. Lastly, digital platforms provide income-generating opportunities to unemployed youth. These opportunities upskill youth and provide them with work experience, increasing their employability in the digital economy.

In the future, these platforms are likely to become the commonplace way of consuming and providing a broad range of services because of the efficiency and cost reduction effects. As digital platforms emerge across multiple sectors, supporting them to scale constitutes a real opportunity for inclusively growing the domestic economy and creating income-generating opportunities for low-skilled South Africans.

Key opportunities in digital platforms

There are currently approximately 119 platforms operating across various sectors and serving different functions in the real economy. Of the 119 found for this report, 84 (or 70%) were found to be locally developed while 29% were developed internationally but operate in the South African market. The development of local platforms indicates that platforms are being developed as solutions to domestic problems.

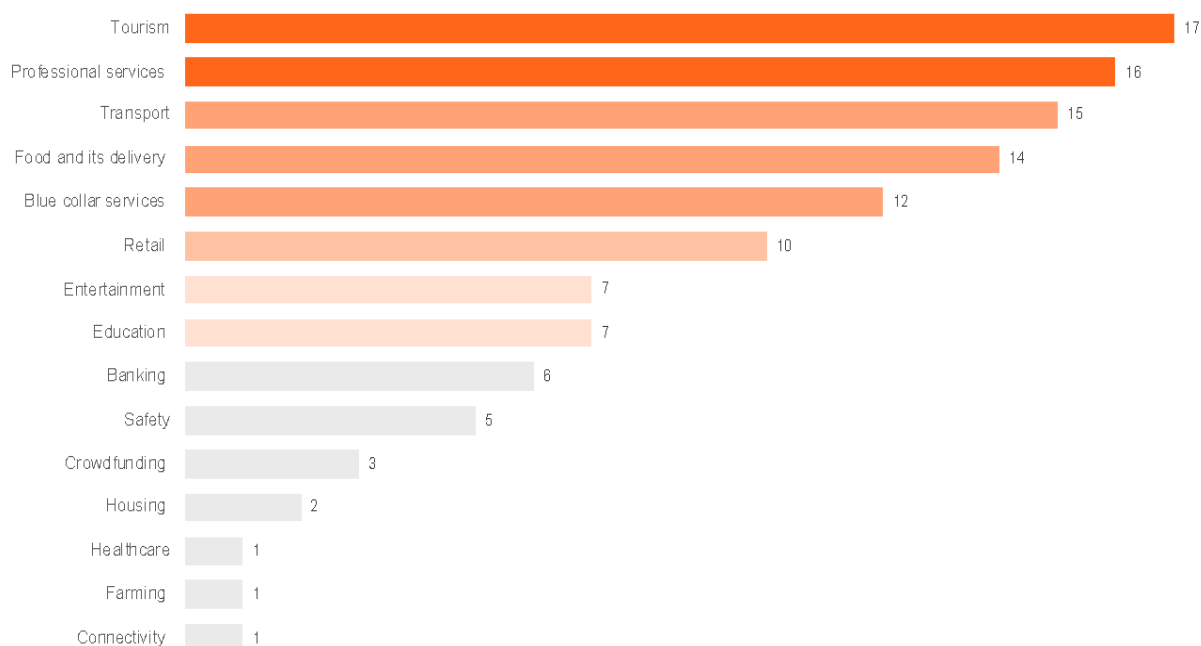
Examining the two graphs below, we see that **the platform economy spans a variety of sectors, with some sectors and functions, such as tourism, professional services, transport, food and its delivery, low skilled services and retail, being disrupted by digital platforms faster than others.** As a result of these changes, platforms have made the sale of goods and services more transparent and competitive⁸⁰. Platforms have also changed the way consumers relate to brands as rating systems have allowed for credibility to be built and reflected to new consumers who have never interacted with the brand before⁸¹. This in turn has changed the way businesses operate, as this constant feedback mechanism has resulted in improved service delivery and customer support.

⁸⁰ South Africa in the Digital Age. Pathways to digital work. Executive summary: A strategy primers for South Africa's digital economy.

⁸¹ Ibid.

Figure 12: Use of digital platforms in South Africa by Sector and Function

The **Tourism, Professional Services, Transport, Food and its delivery, Blue collar services and Retail** sectors have seen the most growth and usage of digital platforms in the South African economy.



Freelancing, Accommodation and E-hailing are the most popular functions that are available on digital platforms in South Africa



Source: Insight2Impact Africa's digital platform database, 2019

Despite the number of platforms that have emerged, most of these remain nascent. The efficiency and cost-reduction effects of demand and supply matching have not been extended to a number of low-skill service sectors, and even where it has the platforms that are active have not yet scaled significantly. In particular, strong competition between digital platforms operating in a particular sector has yet to form, as is the case of markets like India where platforms are achieving significant scale. This is reflective of the fact that the market for digital platforms in South Africa has yet to mature.

This is partly because digital platforms in South Africa largely cater to the relatively affluent middle-class consumer market. As such, these platforms are only providing services to a small portion of consumers and will struggle to scale significantly, especially if they have to share this consumer segment with other competing platforms. To achieve serious scale domestically in a competitive environment, digital platforms will have to develop business models that are relevant to low-income consumers.

In order for South Africa to support the emergence and scaling of multiple digital platforms, it is important to first identify where these platforms have the potential to scale, what their business models look like, and their impact on supporting growth, jobs and transformation. Six areas of high potential are identified here.

Task Matching Platforms

Task-matching platforms reduce many of the frictions and information asymmetries in low-skilled informal labour markets, such as domestic services, gardening, painting, maintenance, and electrical and plumbing work. They do this through creating trust and providing a single platform for workers/businesses to list their services and search for customers/employers who require their services. 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-side participants. A number of these platforms also provide supply-side participants with training to improve their technical skills and customer-service levels.

Transport and Delivery Services Platforms

Platforms for transport and delivery services match demand and supply efficiently. For people seeking transport services, e-hailing platforms offer services at a lower cost to traditional metered-taxi providers and offer similar efficiency gains as the task-matching platforms described above. There are also platforms providing this matching service for the delivery of commercial goods. In the product market, the cost-effectiveness of ecommerce and ease of ordering on these platforms are quickly being recognised by consumers with a rapid growth in demand. Both of these platform types have the potential to create significant low-skill earning opportunities from the demand for logistics and transport services at the front-end of these supply chains. In addition, ecommerce platforms are creating further opportunities for income generation at the back end of the supply chain for small-scale producers and entrepreneurs who have the opportunity to access new markets.

Food Delivery Platforms

Platforms that facilitate the preparation and delivery of food are reforming the restaurant industry as eating out becomes more affordable. Restaurant delivery platforms are providing opportunities for low-skilled drivers to earn income. These include UberEats, Mr D, Order In, and Appetite which connect restaurants offering takeaway orders with independent drivers to customers wanting food delivered. Online food ordering in South Africa is catching up quickly to more mature markets like the US with a 64% increase in food delivery projected through to 2023.⁸² Mr D, South Africa's largest food delivery platform by customer numbers, saw a 210% growth in 2017 alone.⁸³ In 2019, the platform saw a threefold rise in the number of driver partners to 3 000 in one year. Using the same ratio of downloads to drivers, Uber Eats likely has approximately 1 200 drivers.

Tourism Platforms

The tourism sector is also evidencing the gains of unlocking latent demand from digital platforms. Airbnb has significantly reduced the cost of accommodation services in South Africa by allowing homeowners to rent rooms within their homes to tourists. A one-night stay at a hotel in Johannesburg starts from about R1 200, while Airbnb offers accommodation for as little as R250 per night.⁸⁴ This has resulted in more people being able to afford travel to and within South Africa. 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. In addition to accommodation,

⁸² L. Claasen, SA's fast-food sector gets up to speed, Financial Mail, 2019.

⁸³ J. de Villiers, Fast food deliveries are exploding in South Africa - here are the winners, Business Insider South Africa, 2018.

⁸⁴ Based on a web search for available properties in Johannesburg using Airbnb and Trivago, a hotel listing platform, in 2019.

there are untapped opportunities to scale the activities of micro entrepreneurs in the arts and crafts industry. The arts and crafts industry in South Africa is highly fragmented with the majority of craft producers being sold by traders, small, informal producers and cooperatives in poor and rural areas.⁸⁵ However, in recent years, the industry has seen an influx in cheap imports from Asia and other African countries. Research indicates that there are growing market opportunities for craft producers both locally and internationally, however, these opportunities cannot be realised unless local craft producers are more competitive than their Asian counterparts. Digital platforms provide the opportunity for local craft producers to increase efficiencies and access local and global markets.

Job Matching Platforms

Job matching platforms that match youth to jobs can reduce labour market inefficiency. Digital Platforms are increasingly helping connect job seekers, from informal workers to highly skilled professionals, to suitable job opportunities. These platforms make it easier to learn about available jobs and requirements, reduce the cost of recruiting and allow youth to market themselves to a wider audience.⁸⁶ In addition, job matching platforms generate a vast amount of data on the demand for skills. This data can be harnessed to train young people preparing to enter the job market and match their skills with job opportunities.⁸⁷ Furthermore, digital job matching platforms have the potential to deploy their data aggregation and analytical capacity to reduce labour market inefficiency by devising more relevant assessment criteria for specific jobs, educating job seekers on market conditions and demands, and supporting career advancement through credentials and employer endorsements.⁸⁸

E-Commerce Platforms

Platforms that connect informal businesses and SMMEs to suppliers and customers can reduce inefficiencies and help businesses reach new markets. E-commerce platforms are creating opportunities for businesses of all sizes and levels of formality to engage in domestic and international trade by increasing access to customers and suppliers and reducing trade costs. Additional benefits of e-commerce platforms include increased customer satisfaction, better customer retention, innovation of products and services and increased speed to market.⁸⁹ While e-commerce platforms have grown significantly over the last decade, an estimated market size of R10bn in 2018 only accounts for 1% of the total South African retail market.⁹⁰ However, as data costs reduce, logistics improve and trial increases, e-commerce platforms have the potential to reshape the market and scale the operations of informal businesses and SMMEs.

⁸⁵ Makhitha, K. 2017, Challenges affecting small craft producer business growth and survival in South Africa, Journal of Business and Retail Management Research, Vol. 11, Issue 2

⁸⁶ Chen, C & Haymon, M. 2016. Realising the potential of digital job seeking platforms. Prepared for the 2016 Brookings Blum Roundtable

⁸⁷ ILO. 2018. Digital labour platforms and the future of work, Geneva

⁸⁸ Ibid

⁸⁹ Accenture. 2018. Five ways to win with digital platforms. G20 Young Entrepreneur's Alliance

⁹⁰ Ibid

Figure13: Examples of platforms in the key areas of South Africa's platform economy

	International platforms operating in South Africa	Local platforms, some of which operate in other parts of Africa
Low-skilled services	 PetBacker	  Domestly  SweepSouth
Transport	Uber 	  
Food and its delivery		   
Tourism	 	 
Job Matching	 	  
E-commerce	 	  

Source: Genesis Analytics, 2020, Pathways to Digital Work, *South Africa in the Digital Age Strategy Primer*

Given that digital platforms reduce costs through efficiency effects, this is a real opportunity in South Africa. In particular, for digital platforms to be developed across a range of service sectors and skill levels, and for these platforms to scale significantly by tapping into currently underserved consumer segments. This is an opportunity for expanding access to digital economic opportunities for many South Africans, particularly those that may otherwise be locked out of opportunities in the digital economy.

How South Africa can win in digital platforms

Realising this opportunity of digital platforms will require the following actions described in the recommendations section:

- **Expedite spectrum auctioning** and ensure that it is not only allocated to large MNOs. Access to spectrum is essential for speedy, reliable and affordable access to networks and communications which form the basis for digital platforms. Expediting spectrum auctioning will ensure that digital platforms can be scaled to low-income and rural communities.
- **Establish the Wireless Open Access Network (WOAN) for allocation of spectrum** will reduce the cost of spectrum which will facilitate the entry of more digital platform producers.
- **Establish device recycling and refurbishing centres for second hand devices:** Reducing the cost barrier will increase the number of South African who have access to smart devices and digital platforms.

- **Create incentives for relevant local digital content** to ensure that digital content is translated to a wider range of South Africa's official languages. This will ensure that digital platforms are accessible and comprehensible by all South Africans.
- **Development of a competition regime that caters to digital businesses and markets.** The regime should address various risks that range from the ownership of data and data privacy to the availability of spectrum and infrastructure to increase ease of entering the digital platforms market.
- **Establish an inter-governmental coordinating mechanism** among regulators with a common interest in scaling digital platforms.
- **Develop agile regulatory framework and innovation facilitation tools** such as regulatory sandboxes and innovation hubs to promote investment in and scaling of digital platforms.
- **Scale and promote work-from-anywhere digital platforms** that facilitate outcomes-based work for South Africans in townships and rural villages.

3.4. Digitally traded services

Global business services (GBS) are growing at a faster rate and incline trend than many traditional sectors of both advanced and maturing economies. Initially, this boom in demand for trade in services was fuelled by evolving work models, business scalability and the compelling cost-to-value proposition for outsourcing and co-sourcing. Lately, and more specifically within the past 6 months, it has enabled global organisations to move work to nearshore or far-shore locations in an effort to dilute concentration risk geographically brought on by the global pandemic.

Automation, digitisation and the instrumentation and interconnection of devices and communication channels has simultaneously accelerated a subset of the GBS industry known as digitally traded services. As such, this has given rise to new forms of IT-enabled globally traded services that move beyond business services into consumer, social and niche domains. Notably, these services can be delivered ubiquitously by way of new and innovative work-from-anywhere environments, especially during times of crises and global disasters. Renowned as a leading location for the delivery of cross-border and consumption-abroad global business services, **South Africa can leverage these opportunities to provide much-needed domestic business continuity solutions and services that can be exported globally.**

Key opportunities in digitally traded services

As organisations grapple with economic decline, disaster recovery and the sudden and disruptive need for work-at-home environments, they will look to digitally traded services to help them navigate this “new normal”. Put simply, digital trade encompasses digitally enabled transactions in trade in goods and services that can be virtually or physically delivered. As such, this includes digitally delivered software, games, e-books, social services, data or database services and digitally enabled, but physically delivered, goods and services. Digital trade also involves business-to-business transactions within global value chains, as well as transactions between consumers or businesses through online platforms.⁹¹

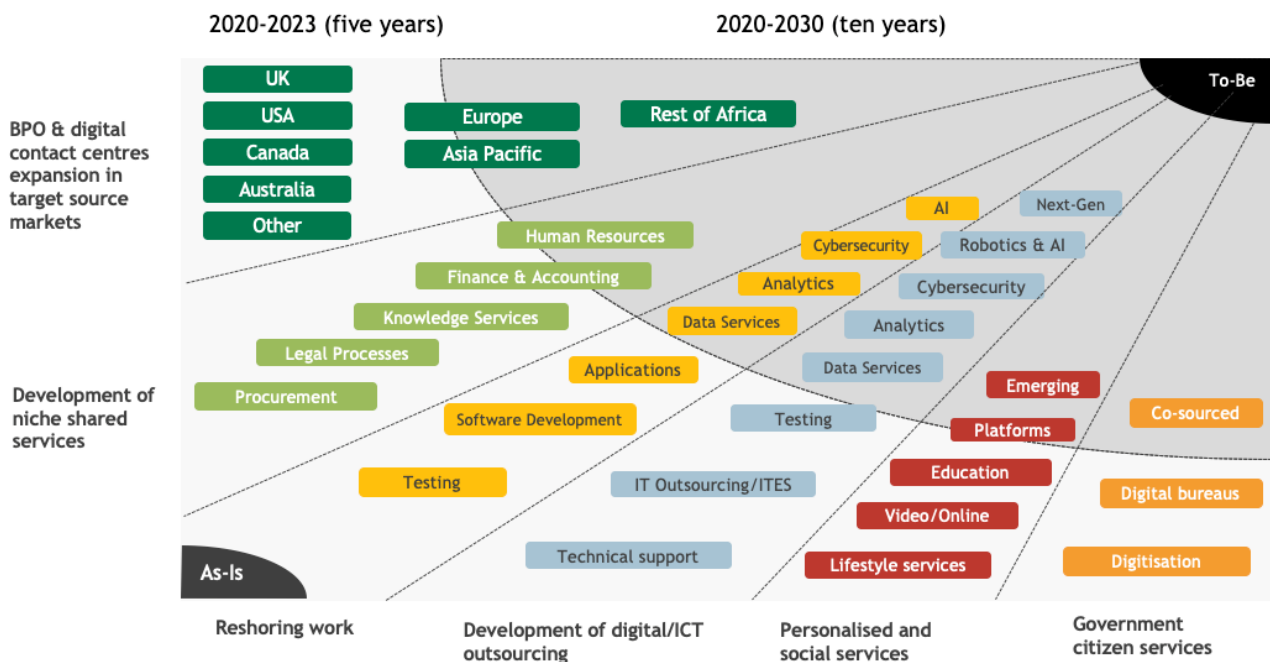
These digitally enabled goods and services are being transformed by intelligent, algorithm-led machines, robots and next-generational technologies. This includes cyber-physical applications such as artificial intelligence, blockchain, machine learning, robotic process automation, the Internet of Things (IoT) and augmented or virtual reality. Moreover, as traditional jobs become more automated and digitised, new work

⁹¹ Lopez-Gonzalez and Jouanjean | 2017

models such as gig economy platforms and virtually enabled business process and customer experience services are becoming more pervasive.

South Africa can solve numerous domestic problems, create more jobs, and generate greater foreign direct investment (FDI) through digitally traded services. In fact, a new generation of advanced GBS providers are already deploying prescriptive analytics to extract actionable business insights from the transactional data they amass during long-term client engagements. They are using these insights to accelerate the time taken to get new services to market, to enhance innovation, to promote stronger customer loyalty and to achieve top-line growth. While voice-based services remain the most pervasive channel across global markets, the need for the digital enablement that facilitates omnichannel customer engagements is growing rapidly. Therefore, digital customer communication channels, machine learning and edge analytics are all playing a role in delivering more intelligent, value-added services to both businesses and consumers. Global organisations are, therefore, looking to partner with GBS providers that are able to engage with customers and understand their unique needs and requirements through data-driven insights.

Figure 14: Areas for expanding globally-traded services in South Africa



Source: developed by Genesis Analytics, BPESA, Harambee Youth Employment Accelerator and Knowledge Executive, 2019 - 2020

These opportunities to capture concrete sources of demand were assessed and validated as part of the South Africa in the Digital Age (SADA), Pathways to Digital Work: A Strategy Primer for South Africa's Digital Economy by Genesis Analytics in 2019. In 2020, they were reviewed and updated as part of ongoing stakeholder engagements, field research and consultations for the ICT and Digital Economy Masterplan for South Africa. The figure above summarises the key areas and specific opportunities where digitally-traded services can expand exponentially. They include BPO expansion in target source markets (including digital contact centre services); development of niche shared services; reshoring domestic ICT jobs back to South Africa, the development of digital/ICT outsourcing services; personalised and social services and government citizen services.

Digital contact centres

Digital contact centre services can create additional opportunities for South Africa to provide next-gen omnichannel services to global markets. Notably, South Africa's compelling offshoring and outsourcing offering

includes a well-established contact centre and service delivery market (ranked second in the world) that is highly sophisticated in terms of technology and communications infrastructure, with a breadth of skills available to support a wide range of services for both the domestic and international markets. These skills include the development of “super agents” that are enabled by automation and technology to provide digitised contact centre services such as web chat, social media, mobile application support and instant messaging. These services can be further augmented and optimised with an overlay of predictive, prescriptive, behavioural and social media analytics expertise.⁹²

Already organisations such as Amazon have expanded their presence in Johannesburg and Cape Town. In June 2020, the retail and tech giant announced it was adding 3,000 new virtual customer service jobs to bring its total permanent workforce in South Africa to 7,000 people. The new job roles range from customer service associates to technical staff and the employees will be working virtually from home to provide round-the-clock support for Amazon customers in North America and Europe. In addition, the public cloud infrastructure of Amazon Web Services (AWS) will enable entrepreneurs and SMMEs to deliver digitally-enabled services. Nevertheless, in broader terms, digital contact centres can reduce reliance on voice-based services by enabling consumers to interact with agents over web, social and self-service platforms. This shift from voice-services to non-voice, digital channels has the potential to create over 55,000 digital contact centre jobs, as part of the broader expansion of BPO services, by 2030. Moreover, these types of services could be facilitated via niche, SMME digital-interaction hubs that support larger, voice-based contact centre operations with the potential to create over 360 small and micro businesses within a period of 10 years.⁹³

Shared services

A similar picture is emerging within the global shared services market, where South Africa is fast becoming a favoured offshoring option for specialist, niche domain services. As it stands, South Africa has a mature and progressive shared services sub-sector with highly qualified talent and digitised services providing sophisticated finance and accounting (F&A), human resource outsourcing (HRO), procurement and legal services to a growing international clientele. In the HRO space there are budding capabilities in e-recruitment, video interviewing, digitised HR-as-a-service, and artificial intelligence for talent acquisition and enlistment. In the F&A environment, centres of service delivery have developed expertise in robotics and automation with the ability to pivot into artificial intelligence and machine learning. However, in order for South Africa to compete effectually on the global stage with India, Malaysia, Poland and the Czech Republic, the country needs to develop a more robust and vibrant domestic shared services market. Moreover, the country's shared services value propositions need to be updated and reviewed in light of COVID-19, hybrid work-from-home and on-premise models and digitally traded trends. Entry-level salaries and average fees per hour also need to be reviewed for the country to become more competitive.⁹⁴ If the country is able to achieve this it could create over 51,000 jobs in specialist, niche services by 2030.⁹⁵ Approximately 30% of these jobs could be housed within over 290 small and micro enterprises.

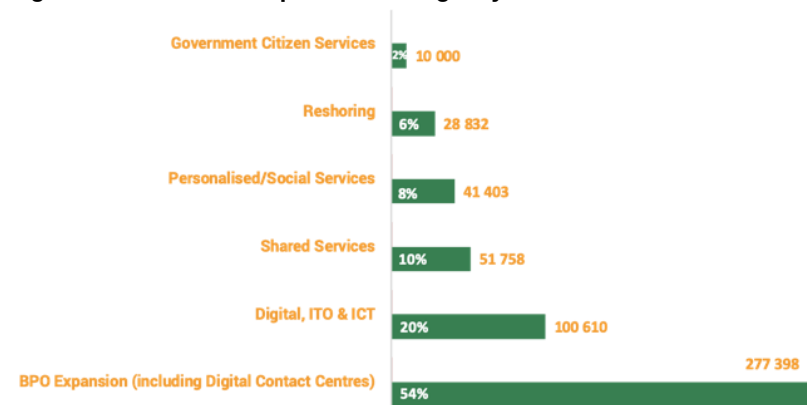
⁹² BPESA and Genesis GBS/Knowledge Executive | 2019 | Gauteng Global Business Market Quantification Report

⁹³ Digital Economy Masterplan Stakeholder Engagement Sessions | July 2020

⁹⁴ BPESA and Genesis GBS/Knowledge Executive | 2019 | South Africa Shared Services Reports: F&A and HRO

⁹⁵ Genesis Analytics | 2019 South Africa in the Digital Age (SADA), *Pathways to Digital Work: A Strategy Primer for South Africa's Digital Economy*, p14

Figure 15: Job creation potential in digitally traded services



Source: Data and calculations made by Genesis Analytics, BPESA and Harambee Youth Employment Accelerator, 2019. Updated by Genesis Analytics in 2020

Digital and ICT outsourcing

As technology-enabled services become more pervasive and interconnected, South Africa can also leverage opportunities in digital and ICT outsourcing. As such, South Africa is emerging as an IT outsourcing (ITO) destination of choice for potential investors in the areas of technical support, data services, data cleaning and labelling, web services, analytics and testing. Moreover, IT-enabling opportunities exist to develop competencies and skills that enable

South Africa to pivot into next-generational digitalised services over the next ten years that includes artificial intelligence, machine learning, blockchain, biotech, quantum computing and nanotechnology. Reforms of the country's IP policies, financing schemes, regulatory environment and commercialisation activities would enable more businesses to create local digital services and products that could be exported globally. In this regard, the real growth potential lies in the North American market followed by Europe and the United Kingdom where South African digital and ICT services can be traded at scale. Notably, this could create an additional 100 600+ jobs⁹⁶ as well as an additional 670 small, medium and micro enterprises over the next 10 years.⁹⁷

Reshoring work

Reshoring and bringing contracts and services back to South Africa that are outsourced to other markets such as China and India, presents a significant opportunity to boost the country's digitally traded services. Many South African businesses rely on these markets to provide services such as software and application development due to their clear talent and cost advantages. In fact, it is projected that about 10,000 jobs in the areas of testing and application development are being outsourced by South African corporates to India alone. In total, it is estimated that over 28,800 jobs have been outsourced to foreign markets. Bringing this international work back to South Africa constitutes a significant opportunity for growing domestic job creation and should be thought of as a form of export revenue. In the longer term, South Africa may be able to scale capabilities in digitally traded services such data storage, analytics, artificial intelligence solutions and cyber security. To make this happen, the country needs to build and implement sustained skills for work programmes that create scalable and sustainable pipelines of talent that are qualified and experienced to fulfil these ICT services. Moreover, financial and non-financial incentives (including B-BBEE score card points) are required to compel these organisations to re-shore work back to South Africa.⁹⁸

Personalised and social services

Personalised and social services is an area of domestic and consumption-abroad services being delivered virtually with business-to-consumer or freelancer-to-consumer digital platforms. In this regard, there are organisations in South Africa that are already providing lifestyle and concierge services, with other centres providing digitised, video-enabled English tutoring to students in China. Notably, Edutech represents one of the biggest opportunities for growth in areas such as web-based learning, virtual teaching and content and course curricula development. Gaming, video and audio-visual media services also have the potential to

⁹⁶ Genesis Analytics | 2019 South Africa in the Digital Age (SADA), *Pathways to Digital Work: A Strategy Primer for South Africa's Digital Economy*, p14

⁹⁷ Digital Economy Masterplan Stakeholder Engagement Sessions | July 2020

⁹⁸ Genesis Analytics | 2019 South Africa in the Digital Age (SADA), *Pathways to Digital Work: A Strategy Primer for South Africa's Digital Economy*, p16

scale and intensify. In this regard, South Africa is well placed to provide online video distribution and content services with organisations such as Netflix already commissioning localised content. As South Africa's digitalisation development advances, so can opportunities to trade in similar personalised and social services (such as long-distance care, geriatric support that's not physical, counselling services and virtual social interaction/support) with greater numbers of domestic and global consumers. In fact, South African service personnel, renowned for their warmth and empathy, would be well-suited to provide such services. This opportunity could create over 41,000 jobs in South Africa by 2030.⁹⁹ In addition, freelancer-to-consumer digital platforms have the potential to empower 410 entrepreneurs and over 270 SMMEs who trade in digital products and services over the next 10 years.

Government citizen services

Public sector and state-owned enterprises in South Africa could significantly improve citizen service delivery, save costs and create more jobs by digitising, outsourcing and co-sourcing non-core functions and operations. Fragmented and siloed business units and functions could be consolidated into centralised contact centres or shared services delivery hubs that drive efficiencies with shared funding, resourcing, best practice proficiency and expertise. In addition, the Mass Digitisation project by the Public-Private Growth Initiative (PPGI) can not only digitally transform the public sector; it can also potentially create 10 000 youth jobs incrementally over a two-year period and establish 12 sustainable black owned enterprises within a period of three years. Already, plans are underway for the project to digitise manual documents in prioritised government departments by creating 9 digital bureaus across the country.¹⁰⁰

COVID-19 opportunities

The unprecedented and extraordinary change fuelled by the outbreak of the COVID-19 pandemic in the early part of 2020 had a significant impact on digitally traded services. Notably, South Africa was one of the few global offshore locations that was able to continue to deliver essential services during the outbreak. Nevertheless, many businesses, outsourcers and industry stakeholders suffered large financial losses and retrenchments. As a result, job growth was impacted across the sector and may continue to decline in the year ahead.

However, an increased focus on outsourcing and offshoring by global enterprises looking to augment their business continuity and disaster recovery plans by spreading their geographical risk will fuel growth in digitally traded services. To capitalise on the sector's significant market perception, credibility, reliability and reputation, the industry body, Business Process Enabling South Africa (BPESA), in partnership with Harambee Youth Employment Accelerator and the Department of Trade, Industry and Competition (dtic) is engaging with its stakeholders to start planning for the recovery of the sector and the gradual emergence into a new-look global economy and a new world of work. This plan touches on a refreshed GTS value proposition, a new approach to offshore market growth, higher levels of domestic market engagement to rebuild the local economy and innovative approaches to skills development and wellness. Moreover, it fast tracks the roll out and usage of digital and cloud technologies, inclusive business growth, innovation, youth job creation and a clear and overarching plan for economic and social transformation.¹⁰¹

How South Africa can win in digitally traded services

Across South Africa, the digital-experience economy, coupled with digitally traded services is disrupting and changing the way we live and work while also enabling business continuity during the global pandemic. Numerous organisations and stakeholders have been inspired by these opportunities and

⁹⁹ Genesis Analytics | 2019 South Africa in the Digital Age (SADA), *Pathways to Digital Work: A Strategy Primer for South Africa's Digital Economy*, p14

¹⁰⁰ Public-Private Growth Initiative (PPGI) for ICT | 2020

¹⁰¹ Genesis GBS | Knowledge Executive | 2020 | Q1 GBS Job Creation Report

embraced them to stimulate business and economic growth. Others are uncertain as to how this current and developing digital environment will impact on jobs, society and life as we know it. All stakeholders agree, however, that a measured, yet bold, approach is required to realise the opportunities that digitally traded services can provide and that this will require the following actions, described in more detail in the critical enablers discussion in Section 4:

To address the critical needs for the scaling of digital and related skills:

- **Reform the SETA funding model from being output-based to being outcome-based** so that funding is prioritised for business-and-outcomes-based skills development and training that is most likely to result in job creation.
- **Modernise South Africa's qualifications and credentialing system** to take into account new ways of learning which include micro-credentials.
- **Establish digital apprenticeship centres** that absorb newly trained digital skills candidates and provide them with practical work experience and mentorship before being absorbed by the labour market.
- **Establish an industry-wide mechanism for re- and up-skilling** for the future skills required in the digital economy. South Africa needs to sharpen its innovative edge and continue contributing to global scientific and technological advancement.
- **Implement large scale integrated workplace learning solutions** across the country for excluded youth that include profiling, matching and sourcing, work readiness training, and integrated workplace learning.

To better market South Africa as a credible delivery location for digitally traded services and convince investors to establish global delivery centres in South Africa:

- **Mobilise digital, ITO and ICT companies to participate in export market opportunities** to support the expansion of South Africa's digitally traded services.
- **Fast-track international marketing and investor engagement in key source markets** that hold the greatest potential for digital traded service exports from South Africa.
- **Create public-private deal making teams** that match-make and facilitate investment and partnerships with global buyers of digitally traded services.
- **Scale-up the dtic's GBS incentive scheme** to attract a broader set of international investors and create more digital and ICT jobs.
- **Enable skills-fit-for-work with financial and non-financial reshoring incentives** to bring digital and ICT work back to South Africa.

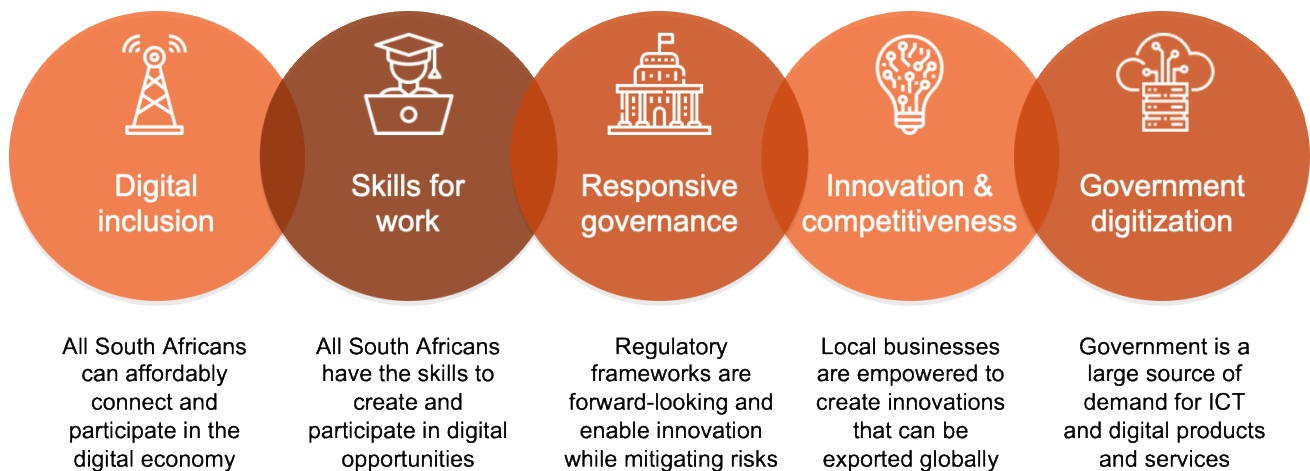
To establish and scale a new source of demand for digital traded services from within the government sector:

- **Consolidate existing contact centres through the President's hotline** to create a single point for citizen support and aggregate government demand for contact centre services across the three different spheres of government.
- **Scale up government frontline citizen care and support services.** This can enable more efficient, citizen-centric services utilising co-sourced or outsourced contact centres over the next three years.

4. CRITICAL ENABLERS FOR DIGITAL ECONOMY DEVELOPMENT

Realising the digital economy big bets identified in this Masterplan will require a concerted effort to put five critical enablers into place. These enablers ensure that businesses, individuals and the public sector have affordable access to digital networks and infrastructure, that there are appropriate skills and resources available to support the emergence and scaling of innovative products and services, and that the public sector is well positioned to safely regulate innovators and support their scaling. The five enablers are shown in the diagram below and elaborated on in the following sections. For each critical enabler, a specific objective is identified with supporting outcomes, actions, responsible stakeholders and timeframes.

Figure 16: Critical enablers for digital economy development



Source: Genesis Analytics, 2020

Given the cross-cutting nature of these enablers, they will require actions from a multitude of government departments and stakeholders across the private sector and civil society. DCDT must play the key role of lead co-ordinator for all of these enablers covered in the Masterplan, but delivery will rely on a number of core partners who have important contributions to make.

4.1. Digital inclusion

The objective for digital inclusion is to ensure that all South Africans have the ability to connect and participate in the digital economy by enabling affordable access and reliable digital infrastructure. Digital access is a cross-cutting issue that addresses matters of the digital divide in South Africa and is therefore a basic prerequisite for leveraging economic opportunities. Access should be considered as an entry-level condition for digital inclusion. In order for all citizens to participate in the digital economy, digital connectivity needs to be available, affordable and used in an impactful way. Critically, access needs to be followed by usage, and usage needs to be directed towards delivering positive individual and societal impacts.

An overview of this section considers the components that matter for digital inclusion. This covers internet connection pertaining to speed, reliability, cost and mechanisms of connections; hardware; software and digital content as well as language requirements. The following outcomes and actions, along with the required stakeholders and timeframes, indicate how the overall objective of digital inclusion will be achieved. This is shown in the figure below and elaborated on in the remainder of this section.

Outcomes	Actions	Timeframe
Universal coverage of broadband internet at a minimum of 10mb per second and at a cost of R399 per month	• Expedite spectrum auctioning	1 year
	• Provide a clear direction regarding the establishment of the Wireless Open Access Network (WOAN) and how allocation of spectrum will work	1 year
	• Improve the national backbone (backhaul) infrastructure to cover remote areas.	3 years
	• Reduce the administrative burden of obtaining wayleaves	1 year
	• Provide subsidies to private sector to make last-mile connection to homes and communities	5 years
Affordable smart devices that allow for streaming content and making transactions in the digital economy.	• Establish device recycling and refurbishing centres for second hand devices	1 year
	• Upgrade shared public facilities to provide smart device and broadband connectivity access	1 year
	• Utilise and scale up existing incentive packages for the ICT industry that will encourage manufacturing of electronics	3 years
Local and relevant content is available that benefits and appeals to all users	• Establish the Digital Development Challenge Fund (DDCF) and define the scope of the DDCF to include applications for developing digital ecosystems	3 years
	• Provide more and better targeted funding for research into NLP	1 year
	• Create new training data through the translation of publicly accessible government documents and services	3 years
	• Support the coordination in the transition and language research and services ecosystem	1 year
Infrastructure supports the rollout of emerging technologies.	• Create incentives and an enabling environment for the establishment and expansion for data centres and cloud adoption in South Africa	3 years

Outcome 1: Universal coverage of broadband internet at a minimum of 10mb per second and at a cost of R399 per month. These technical specifications are based on input from digital infrastructure and internet service provider industry associations using the average cost of installation and service provision for middle-income households. South Africa's internet penetration, according to latest 2017 data, is low at 56 % (The World Bank, 2017)¹⁰². As indicated in the Minister of Communications and Digital Technologies (DCDT)'s performance agreement with the President, the target is to achieve 80% internet penetration by March 2024. The actions required to achieve this outcome include:

- **Improve the national backbone (backhaul) infrastructure to cover remote areas.** This action is in progress under the SA Connect Programme. The programme aims to aggregate the demand for broadband connectivity among government facilities, such as post offices, schools, clinic, police stations, libraries, and other sites. This is undertaken by the DCDT infrastructure branch.

Plans for SA Connect include the rollout of Phase 1, currently underway. This involves connecting a total of 960 sites by September 2020 and another 40 000 sites, at a national and provincial level, with a minimum speed target of 10mb per second, planned for the second phase. A feasibility study for Phase 2 is scheduled to be complete by December 2020, which will provide a business case to commercialise the infrastructure and crowd in private financing (through a hybrid financing model), and an implementation plan.

¹⁰² The World Bank, 2017. The World Bank. [Online]. Available at: <https://data.worldbank.org/indicator/IT.NET.USER.ZS?locations=ZA> [Accessed 9 December 2020].

To date, the implementation has been carried out by Broadband Infraco (BBI) and State Information Technology Agency (SITA) with plans for private sector participation. Such plans entail sub-contracts through the BBI to a number of private service providers, including SMEs to roll out part of the last mile infrastructure to SA Connect facilities. Deployment will require the upgrade of some backhaul infrastructure. Therefore, the networks are regularly upgraded to accommodate the increase in network traffic as private sector deploys and expands their own fibre networks.

The ability for government to shift online will facilitate the digitisation of government services and generate efficiency and cost reduction benefits, as well as creating demand for digital services in the local market. The outcome should be addressed within the ambit of the SA Connect Programme which will include the roles of the DCDT, DBSA and participation of private sector players. This is to be addressed over the next 3 years.

- **Provide funding to private sector to make last-mile broadband connection to homes and communities**, pertaining to both fibre as well as other public broadband connectivity solutions such as WiFi hotspots. This action is yet to be implemented. The public infrastructure roll-out addressed by the SA Connect Programme is essential for last-mile connectivity by the private sector. This is because once the government facilities are connected, the private sector can use the same infrastructure to provide connectivity to the surrounding communities. The abovementioned feasibility study will therefore include investigating the commercial models that can be built by utilising backhaul infrastructure to connect private communities. Funding is necessary to cover some of the capex costs of deploying these connections in lower-income communities.

This outcome will be addressed through a Broadband Connectivity Fund which in the process of being established by DCDT and DBSA. The first task of the Fund will be to establish the parameters on which funding will be allocated and provide a transparent governance framework for the adjudication of applications, disbursement of funds and monitoring of performance. This will include the determination of which low-income areas are to be covered by the first phase of the Fund, the defining of the minimum technical specifications for private providers and providing a clear payment and monitoring framework. The DBSA can make use of its existing governance framework and disbursement mechanisms but may want to appoint additional capacity in the form of industry experts to assist with these determinations.

- **Reduce the administrative burden of obtaining wayleaves** from cities in the next year. This action is in progress. Any investment in the rollout of digital infrastructure requires a proper regulatory regime. The regime should ensure the administrative burden of obtaining wayleaves from cities is reduced and promotes access to facilities (e.g. ducts and poles), which significantly reduces the civil engineering works cost of deployment. The DCDT is in the process of finalising a Rapid Development Policy which intends to expedite the process of private sector digital infrastructure deployers requesting and receiving approval from local municipalities for wayleaves. Therefore, the DCDT would be responsible for the execution of this outcome within a year.
- **Expedite spectrum auctioning** and expand allocation beyond large MNOs. This action is in progress but must be urgently expedited. Addressing affordability extends to improving the cost structures of mobile network operators (MNOs) which enables affordable data prices as a barrier to digital access. Spectrum is also important for efficient network coverage and alleviation of network congestion, particularly in areas that require increased amounts of data use, resulting in congestion; or more dense rural areas.¹⁰³ The release of spectrum as a means to address efficient coverage is more economical compared to investing in the

¹⁰³ Current developments in this area include Vodacom's investments of R200m in Eastern Cape to deploy 20 new base stations in urban areas, and a further 18 in rural areas. Investments include modernising existing sites to create network capacity and efficiency. See Samuel Mungadze (2020), *Vodacom pumps R200m into ECape network expansion drive*, ITWEB.

expansion of base stations. It is also essential for the deployment of 5G, detailed later in this section. This action must be undertaken by ICASA within the next year.

- **Providing clear direction on the Wireless Open Access Network (WOAN)** and how the allocation of spectrum will work. This action has yet to be started. The intention of the WOAN was to be set up as a network provider, to enable smaller operators to access it to facilitate its services as a means to enhance competition in the downstream mobile services market.¹⁰⁴ Such operators can benefit from not having to invest in their own infrastructure. Therefore, it enables sharing the cost of the network amongst numerous operators. However, there is much clarity to be provided on how the WOAN will be established, such as the guidelines on infrastructure sharing in terms of the use of infrastructure to access the WOAN, as well as the allocation of spectrum to the WOAN, amongst other considerations.

Outcome 2: Ensure that South Africans have access to affordable smart devices that allow for streaming content and making transactions in the digital economy. Access to broadband internet is meaningless if South Africans do not have devices to make use of the connection. The actions required to achieve this outcome are to:

- **Establish device recycling and refurbishing centres for second hand devices.** This action has yet to be started. This can be done through a challenge fund mechanism which supports disruptive and innovative business models that leverage old devices from the local market and redundant stock from device retailers to return damaged, donated or old devices to a usable state for the second hand market. It is important that such devices are of good quality and made available for sale to low-income consumers at prices significantly below the retail prices for new devices. DCDT can play a key co-ordinating role in establishing the challenge fund, possibly under the planned Digital Development Challenge Fund.
- **Upgrade or develop shared public facilities** that are well placed near points of interest such as schools, universities, or libraries that offer the use of digital devices and broadband internet connections for free or at a low pay-per-use fee for use by the public. A number of community centres already exist which can be upgraded to provide computing and smart device facilities with an internet connection. This is being considered as part of the President's Youth Employment Intervention and can be undertaken within 1 year.
- **Utilise and scale up existing incentive packages for the ICT industry that will encourage manufacturing of electronics** in South Africa, such as low-cost tablets, computers and smartphones and autonomous vehicles such as drones. South Africa already has some local manufacturing capacity for laptops and computers from companies like Mustek and Yekani manufacturing, however, local producer's market share is capped at around 10%.¹⁰⁵ This action to scale up existing incentive packages has yet to be started. This may be addressed in the next 3 years by organisations like the Small Enterprise Development Agency (SEDA) or the Small Enterprise Finance Agency (SEFA) and assisted by existing financing institutions in South Africa, such as the IDC, PIC and others. This includes a requirement for further development of the Preferential Procurement Policy Framework Act (2017) by the dtic which specifies the minimum amount of local content used in manufacturing to ensure that government procurements support local industry. However, the Act does not specify a framework for how much support government should give to local industries and firms as an off-taker. This can be incorporated and harmonised with dtic's manufacturing incentives structure over the next five years.

Outcome 3: Local and relevant content is available that benefits and appeals to all users. Access has to translate to usage. Meaningful usage is related to the level of digital literacy and foundational competences and therefore relates to how South Africans perceive the benefits received from the use of ICT infrastructure and

¹⁰⁴ ICASA (2019), *Notice of the licensing process for International Telecommunications Spectrum*, No 42820

¹⁰⁵ DTIC, 2014. 'Support for localisation of IT devices.' Available: http://www.arei.co.za/news/Localization_of_PC-tablet-laptop_Assembly-Oct2014.pdf; Producer examples: Pinnacle, CZ Electronics, Leema Industries, Samsung SA, Hi Sense, Skyworth, LG Electronics.

related services. This is driven by whether there exists relevant content or services such as e-commerce services, online learning and eGovernment services that are beneficial and appeal to all consumers of such services, in particular, lower income users and poorer communities which exhibit lesser appetite for usage due to irrelevant content. The actions required to achieve this outcome are:

- **Establish the Digital Development Challenge Fund (DDCF) and define the scope of the DDCF to include applications for developing digital ecosystems.** The Digital Development Challenge Fund (DDCF) has absorbed entirely the Universal Service and Access Agency of South Africa (USAASA) as outlined in the ICT White Paper Policy to address ICT access. The fund will ultimately support the financing of infrastructure and demand stimulation projects, as well as supporting emerging SMMEs to link them to related market opportunities. The DDCF comprises an investment framework to guide the Minister of the DCDT, as well as a technical committee to identify the application and tech relevant projects that address infrastructure challenges.

The DDCF should explicitly seek applications from informal sector players, such as taxi associations, to develop inclusive digital ecosystem with relevance to informal sector segments. The types of applicants to this fund would be stakeholders like the Greater Alberton Taxi Association (GATA) that are looking to develop this kind of ecosystem but require funding to get it off the ground. This action should be addressed by the DCDT within a year.

- **Provide more and better targeted funding for research into Natural Language Processing (NLP)** which offers the possibility of automated translation at lower cost. These NLP systems require significant volumes of data (i.e. written content) in the languages it aims to translate. This funding should be used to scale local expertise in automated translation research. This could take the form of post-graduate bursaries or direct financing of entities in the translation community. This action could be undertaken by CSIR and DHET with co-ordination by DCDT.
- **Create new training data through the translation of publicly accessible government documents and services.** Scaling the availability of training data is a pre-requisite for supporting automated translation research. These NLP systems are data intensive and require input (i.e. training data) to learn new languages. This would not only provide researchers with more data but also improve individual access to government documents and services. The translation community detailed above would be a critical facilitator of this process.
- **Support the coordination in the transition and language research and services ecosystem.** The automated translation community and other interested parties will be key in unlocking the tools for translating content to all South African languages. While there are ongoing efforts to align the efforts of this community, there remains room for improvement. A permanent working group of researchers, advocates, translators and others would help to provide visibility of capabilities and support collective efforts. This working group could be housed under and convened by an entity such as Pan-South African Languages Board (PanSALB) and the South African Centre for Digital Language Resources (SADiLaR), the costs of which could be carried by the government, for example by the Department of Arts and Culture.

Outcome 4: Infrastructure supports the rollout of emerging technologies. Such technology developments are important to enhance connectivity, reliability, and efficiencies in the way businesses operate, through amongst other mechanisms, facilitating cloud access. This outcome can be achieved through the permanent release of spectrum as indicated earlier in Outcome 1. A further consideration relates to 5G spectrum licensing. In this regard the DCDT is working on a 5G policy, forthcoming. Addressing wayleaves will also enable 5G deployment, and is currently being addressed by the DCDT. In addition, the DCDT is addressing the need to accelerate the deployment of networks like 5G and LTE. This is detailed in the newly gazetted policy relating to the deployment of networks in South Africa.

Cloud infrastructure, platforms and services built on the cloud is an essential enabler for digital transformation. Taking into consideration the policy on network deployment and the outcome to permanently release spectrum, a relevant action pertains to the **creation of incentives and an enabling environment for the establishment and expansion for data centres based in South Africa** that can service local and regional demand. AWS in South Africa, for example, is already positioned to deliver opportunities pertaining to public cloud adoption in South Africa. The DCDT's data and cloud policy team has undertaken work regarding policy interventions (detailed more in the Responsive Governance section below) that address the expansion of data centres.

A policy intervention in this area includes adopting strategies that will enable SMMEs open access to data in order to develop their applications. It also includes the intervention to ensure that any investments made to data centres and cloud services complies with BBBEE objectives. This is in line with The Centre for High Performance for Computing (CHPC) in the CSIR, and Dell's establishment of HPC, the fastest in Africa. This was established with the intention to increase access to computer resources for previously constrained or excluded users as well as the expansion of research capabilities, with increased capacity to also expand the private sector user base.¹⁰⁶

4.2. Skills for work

The objective for skills for work is to establish an education and skills development ecosystem that provides all South Africans with the skills required to create and participate in the economic and social opportunities in the digital economy. In order to achieve this objective, this enabler builds on the work done in the National Digital and Future Skills Strategy and adopts a life-cycle approach to skills for work and identifies outcomes that are targeted at three levels of South Africans: individuals in the basic education system, individuals in the tertiary education system and individuals in the labour market. This approach will ensure that all South Africans are equipped with the skills that allow them to develop, utilise and complement technology in order for digital economic opportunities to scale.

South Africa currently has over 200 000 vacant jobs that relate to digital skills.¹⁰⁷ To understand what is needed to create a scalable pipeline of demand-driven candidates, Harambee commissioned Genesis Global Business Services | Knowledge Executive to conduct a survey and mapping process of digital and ICT roles in South Africa. The research collected detailed information on what roles are in most demand across 15 vertical industries in South Africa, and what functions employers expect those roles to cover. The top entry-level, intermediate and advanced roles included the following:

¹⁰⁶ CSIR (2016), CSIR's Centre for High Performance Computing Unveils the fastest Computer in Africa,

¹⁰⁷ Based on LinkedIn posts that remain unfilled

Figure 17: Harambee mapping of the most in-demand digital jobs

Most in-demand by experience level: key findings Ranked according to estimated demand for each role		
Entry Level Roles	Intermediate Roles	Advanced/Senior Roles
1  Desktop Support Technician	 Mid-level Software Developer	 ICT Engineer
2  Junior Software Developer	 Cyber/IT Security Specialist	 Lead Solutions Architect
3  Data Analyst	 Mid-level DevOps Engineer	 Senior UX/UI Designer

Source: Harambee Mapping of Digital and ICT Roles in South Africa

Building a scalable pipeline of skills to take up these jobs will require the following outcomes and actions, indicated along with the required stakeholders and timeframes.

Outcomes	Actions	Timeframe
South Africans exiting primary and secondary schooling are equipped to participate in the digital economy and take up tertiary digital skills training opportunities.	- Provide a tablet to every school student in need - Current developments undertaken to review and update the curriculum should be strengthened - Ensure teachers are trained to effectively deliver the curriculum - Fund vendor-aligned curriculum for school-level early exposure	2 years 3 years 3 years 5 years
South Africa's tertiary training ecosystem provides a scalable pipeline of demand-driven candidates that are prepared to take up work in the digital economy.	- Reform the SETA funding model from being output-based to being outcome-based - Identify and prioritise relevant digital skills and occupations - Modernise South Africa's qualifications and credentialing system - Establish digital apprenticeship centres - Ensure all SETAs incorporate digital skills planning into their sector skills plans - Set aside discretionary SETA funding for micro-credentials - Establish formal measures to provide for mutual recognition of qualifications across all tertiary institutions - Ensure curriculums across all disciplines in TVET institutions are designed to provide students with relevant skills that enhance digital literacy	3 years 3 years 5 years 2 years 2 years 3 years 3 years
South Africans that are already employed, or unemployed South Africans looking for work opportunities, can access re- and up-skilling to take up work in the digital economy.	- Establish an industry-wide mechanism for re- and up-skilling - Implement large scale integrated work place learning solutions - Establish a digital skills industry association that will execute on digital skills delivery	1 year 3 years 2 years

Outcome 1: South Africans exiting primary and secondary schooling are equipped to participate in the digital economy and take up tertiary digital skills training opportunities. This outcome aims to close the digital divide by building foundational digital literacy skills across the population and increasing student interest and participation in digital tertiary education. Critical to this is facilitating access to digital tools and devices and providing a platform for alternative, creative learning. Similarly, updating the curriculum and ensuring higher uptake of STEM subjects will support digital user skills, digital specialist skills and digital business skills. This requires teachers who are trained to navigate these new approaches and effectively transition students to tertiary education.

The actions required to support this outcome are:

- **Provide a tablet to every school student in need** so that they can access online educational content at school and when learning from home during the COVID-19 pandemic. In addition, this action will ensure students have the skills necessary to use digital tools and products and contribute to improving overall digital literacy; reducing the digital divide and stimulating learner interest in the digital economy. This should be complemented with providing teachers with the digital tools necessary to support teaching of students. This action may form part of the work plan of the Department of Basic Education in partnership with private sector partners, such as telco and device distribution companies, within the next two years.
- **Current developments undertaken by the Department of Basic Education to review and update the curriculum should be strengthened** in accordance with international best practice and aligned to current and emerging digital concepts. The STEM education curriculum should further enhance students' skills and knowledge of emerging technologies. This must be complemented by increased participation in STEM subjects as increased exposure to STEM in school will increase the proportion of students who pursue careers in the digital economy. This action can be driven forward by DCDT along with the Department of Basic Education, Umalusi, the Department of Science and Technology and University Education Departments within the next three years.
- **Ensure teachers are trained to effectively deliver the curriculum.** A formal approach for upskilling teachers is critical to ensure harmonisation between teachers' skills and students' curriculum. This includes training on the use of digital tools and devices. This action should be considered by DCDT alongside the Department of Education, the South African Council for Educators and Teachers Unions within the next three years.
- **Fund vendor-aligned curriculum for school-level early exposure** through after school programmes. SiMODiSA Association is planning to pilot a digital hubs programme in 20 high schools in the Western Cape that provide vendor-aligned training to students in an afterschool programme. This programme will provide students with more complex digital skills, increase awareness and interest in pursuing digital careers and provide students with vendor certification that will increase the likelihood of accessing work or other school leaver programmes. Funding must be allocated to fund this pilot across high schools in South Africa. This action must be a partnership between DCDT and the SiMODiSA Association, with support from the PMO on Youth Employment in the Presidency, and other interested stakeholders that can contribute resources or knowledge, over the next five years.

Outcome 2: South Africa's tertiary training ecosystem provides a scalable pipeline of demand-driven candidates that are prepared to take up work in the digital economy. This outcome aims to ensure that the tertiary education ecosystem is responsive to the pace of technological change and the nature of digital work. By promoting an environment that incrementally and consistently helps students learn and relearn, and changing the incentive structure for training, this outcome aims to ensure that South Africans in the tertiary

education ecosystem are equipped with relevant skills for the digital marketplace. Concurrently, it should also enable inclusive access to training for students in remote areas and economically disadvantaged communities.

The actions required to support this outcome are:

- **Reform the SETA funding model from being output-based to being outcome-based** so that funding is prioritised for training that is most likely to result in job creation. This model allocates funds for training on the basis of whether the training has helped students acquire a job. Job placement rates are primary indicators in an outcomes-based funding model. A 70% placement requirement is advised, accompanied by an update of the content of the training and informed by industry demand. This will ensure that resources are prioritised on training that is needed to fill demand gaps in the market, rather than on any training that is related to the sector. DCDT can support this as part of the ongoing work of the Department of Higher Education and Training, the various SETAs and other education and labour stakeholders over the period of three years.
- **Identify and prioritise relevant digital skills and occupations** responsive to industry requirements as proposed in the National Digital and Future Skills Strategy. The National Digital and Future Skills Strategy sets out many layers at which digital skills should be given attention, and many mechanisms for advancing digital skills. The next step involves specifying and prioritising specific digital skills and occupations that will be in demand and revising these on a regular basis as the nature of skills demand and supply changes. This action must be undertaken by DCDT and the Department of Higher Education and Training in the next two years.
- **Modernise South Africa's qualifications and credentialing system** to take into account new ways of learning which include micro-credentials. In addition to traditional ICT qualifications, micro-credentials (whereby learning is typically developed in a short online format) should be formally recognised. A framework that enables this learning would have to recognise credentials that are granular and stackable with a flexible, demand-led approach to learning that creates job opportunities. Formally accrediting micro-credentials would ensure that they can be recognised as part of the BBBEE scorecard on skills development, funded by SETAs and offered as part of formal university curricula. It would further increase the pace of reskilling and ensure students adapt faster to the pace of technological change and remain competitive. This must be taken forward by DCDT along with the Department of Higher Education and Training, the South African Qualifications Authority and other education and labour stakeholders over the course of three years.
- **Establish digital apprenticeship centres** that absorb newly trained digital skills candidates and provide them with practical work experience and mentorship before being absorbed by the labour market. SiMODiSA Association is currently prototyping digital apprenticeship centres which would fund new trainees. These centres will focus on absorbing candidates and offering digital services currently outsourced offshore with two important outcomes; the structured mentorship and apprenticeship programme would provide trainees with work readiness skills, facilitating a better transition into the workplace and allow trainees to be absorbed by the public and private sectors. This action must be undertaken by DCDT in partnership with the SiMODiSA Association and with support from the PMO on Youth Employment Creation in the Presidency. It should also include partnership with digital incubators or alternative academies, such as those offered by SEDA, over the next five years.
- **Ensure all SETAs incorporate digital skills planning in the sector skills plans** taking note of the specific applications of digital technologies and digital process innovation in their respective sectors. MICT SETA will thereafter develop digital skills planning informed by the plans of other SETAs. It is critical that specific attention is paid to skills development for low skilled workers as this will ensure that the gains of labour market participation in the digital economy are equitably distributed. This action

must be taken forward by DCDT along with the Department of Higher Education and Training, in partnership with the various SETAs over the next two years.

- **Set aside discretionary SETA funding that is not subject to accreditation approval for micro-credentials.** Discretionary grants are currently paid out for skills development projects linked to scarce and critical skills. Reallocating this funding to micro-credentials will expand the capacity of micro-credentialing institutions, thus increasing the supply of students with skills in demand. This action must be taken forward by DCDT with the Department of Higher Education and Training, in partnership with the various SETAs over the next two years.
- **Establish formal measures to provide for mutual recognition of qualifications across all tertiary institutions.** Structured arrangement must be introduced to remove the divisions between vocational training and academic education, so that these are seen as complementary and mutually reinforcing stages within the overall digital skills continuum. This will encourage students to obtain micro credentials and digital qualifications in addition to academic qualifications, allowing them to gain multi-disciplinary skills that will enable them to effectively participate in the digital economy. This action must be driven by DCDT with the Department of Higher Education and Training, Universities South Africa and the Council on Higher Education, over the next three years.
- **Ensure curriculums across all disciplines in TVET institutions are designed to provide students with relevant skills that enhance digital literacy.** This requires a review of current curricula in TVET institutions to ensure that graduates are prepared to engage with digital concepts as it relates to their sectors. This also involves the review of the ICT and digital skills curricula to ensure that it is relevant to needs of the labour market. This is critical in ensuring digital fluency for all disciplines. Core in this reorientation is focusing on opportunities for the practical application of skills during studies. This action must be undertaken by DCDT with the Department of Higher Education and Training, SETAs, TVET institutions and the Council on Higher Education over the next three years.

Outcome 3: South Africans that are already employed, or unemployed South Africans looking for work opportunities, can access re- and up-skilling to take up work in the digital economy. The short lifespan of technologies coupled with the rate of change require that individuals in the labour market adapt fast and are provided with upskilling and reskilling opportunities. By increasing the visibility of future skills requirements and providing close the gap interventions, this outcome will reduce the pace at which South Africans in the labour market are skilled and increase the placement rate of individuals in work opportunities in the digital economy. The actions required to support this outcome are:

- **Establish an industry-wide mechanism for re- and up-skilling** for the future skills required in the digital economy. This comprises of a sector skills digital learning platform that supports agile and intuitive digital learning with a knowledge platform powered that complements the National Pathway Manager and share skills records and credentials. The platform will be accessible throughout the skills development lifecycle from school to the work place and will support learning at all levels of work. This action must be executed by DCDT with support from BPESA, the PPGI ICT working group and the labour sector over the next year with funding provided by the President's Youth Employment Intervention.
- **Implement large scale integrated work place learning solutions** across the country for excluded youth that include profiling, matching and sourcing, work readiness training, and integrated workplace learning. This action will accelerate the employment of excluded youth for BPO, digital/IT reshoring. It will comprise of a workplace learning programme, where learning interventions are provided based on the individual's education and experience and ensure that individual are consistently reskilled. This action must be undertaken by DCDT with demand-led industry bodies, such as BPESA and other sector

industry associations, with support from the PMO on Youth Employment in the Presidency over the next three years.

4.3. Responsive governance

The pace of innovation in the digital economy is resulting in the emergence of entirely new business models. Regulations are often slow to adapt which means they can either stifle innovation from scaling or fail to adequately mitigate the risks presented by these new business models. This critical enabler aims to develop **regulatory frameworks that are forward-looking and enable innovation and growth, while protecting consumers from potential risks**. The following outcomes and actions, along with the required stakeholders and timeframes, indicate how this objective will be achieved.

Outcomes	Actions	Timeframe
South Africa's data access and sharing regulation is updated	Development of a policy that addresses data access and sharing that supplements the current Protection of Personal Information ("POPI") Act.	3 years
A specific competition regime for digital markets is established	Development of a competition regime that caters to digital businesses and markets	3 years
Sector regulators are empowered to adopt agile approaches to regulation and enable business experimentation with new technologies	South Africa's cyber security policy must urgently be updated to take into account the growing volume of activities and risks expected in the digital economy	1 year
	Regulators must identify the key regulatory blockages to the scaling of digital businesses and formulate an action plan for addressing this	3 years
	South Africa's legislative framework must be updated or amended to take into account the emerging opportunities and risks presented by 4IR technology application	5 years
Different regulatory authorities collaborate and harmonise policy and regulatory approaches and strategies.	Establish an inter-governmental coordinating mechanism	1 year
	Develop a methodology for measuring the size and nature of the digital economy	1 year
	Establish and execute national strategies for the development and application of digital technologies in priority domains	3 years
	Develop agile regulatory framework and innovation facilitation tools	5 years

Outcome 1: South Africa's data access and sharing regulation is updated. There is a need for the development of a policy that addresses data access and sharing that supplements the current Protection of Personal Information (POPI) Act. The custodians of this intervention will be the DCDT, along with various stakeholders, regulatory bodies and authorities, such as the Competition Commission and others. This process is currently being undertaken, with a target to be achieved within 3 years at most.

- Current developments in this process pertain to access to data and cloud.** Access to non-sensitive data is essential for uses that span scientific research, innovation and advancement of capabilities that address societal and developmental needs. Forward-looking categorisation of information for access purpose is needed to encourage the development of the digital economy. Policy interventions in this regard span matters of data sharing, data sharing & interoperability, ownership, data sovereignty, economic rights, integrity and quality; open data platform, open big data brokers and a digital trust framework. This is underpinned by the recommendation to have all public data captured in a digital format; and a National open data strategy that will lead to an Open Government Data action plan.

- **Developments in this policy area also address data security needs** regarding the safe keeping of data from unauthorised access and distribution. Policy interventions include: Storing data in the HPCDPC which aligns with security measures defined by the Minister of State Security; reviewing the current Minimum Information Security Standards (MISS) and Protection of State Information legislation that enables data protection in the context of digital markets; government use of private cloud for sensitive data in line with the Promotion of Access to Information Act (PAIA), and the processing of personal and non-personal data to comply with existing data protection policies and legislation – POPI Act and PAIA.

Outcome 2: A specific competition regime for digital markets is established. The Competition authority in South Africa, as well as the DCDT, have undertaken a process of formulating the relevant recommendations and interventions towards enhancing and protecting competition in digital markets.

- **The Competition Commission has released a publication on its approach to regulating competition in the digital economy pertaining to competition and regulatory issues.** The strategic thrust of the digital market and competition policy will ultimately be aimed at issues of de-concentration and the promotion of SMMEs, shared prosperity as well as inclusive growth. The scope of recommendations address the need for collaborative solutions with the consumer protection law in order to address the potential risks of individual privacy when it comes to the ownership of data and data privacy. This also considers the role of the Commission relating to the use of personal information as a means to purchase services from digital platforms. It addresses the urgency relating to the availability of spectrum and infrastructure deployment as a means to lower barriers to entry for smaller digital platforms. Beyond access, the Commission recommends the updating of several competition and industrial policies to enable start-ups to compete with dominant firms. Other recommendations identify the need to digitise government services and in particular, shift regulation relating to financial services, to broadly encompass financial networks which include telecoms and e-commerce, for the benefit of consumers. In addition, broader regulation should enable greater inclusion of the population, in the financial services sector. The scope of recommendations by the Commission also relate to competition with regards to merger control, collusion and abuse of dominance as well as vertical restraints.

The DCDT's data regulation and cloud policy has proposed policy interventions that relate to matters of the competition regime, in South Africa, regarding data driven competition. The DCDT, in consultation with the relevant regulatory bodies, recommends policy interventions that address competition relating to the "free, accessible, interoperable and reusable" (FAIR)¹⁰⁸ principles of data. Competition enhancing interventions will support an open data strategy that ultimately supports the use of data for development. This open data strategy will enable the development of a regulatory framework that encompasses data trading, sharing and portability as well as interoperability and exportability. These recommendations address the lack of existing legislative and policy frameworks to address all areas of digital regulation relating to data, such as consumer choice, privacy, data access, trade laws and others. It will also account for issues of the concentration of data ownership.

The outcome to update and develop the competition regime can be addressed by various stakeholders, such as the Competition Commission, the National Consumer Commission and the dtic and should be addressed within 2 years.

Outcome 3: Sector regulators are empowered to adopt agile approaches to regulation and enable business experimentation with new technologies. With the rapid pace of change in business models and market structure as a result of technology, regulators at all levels of government in South Africa will need to adopt a flexible and forward-looking approach to regulation. This includes monitoring how the sector or area

¹⁰⁸ Based on discussion with the DCDT, data regulation and cloud policy branch

within the regulator's mandate is evolving and actively unblocking regulatory obstacles to the scaling of digital businesses. This will require the following actions:

- **Regulators must identify the key regulatory blockages to the scaling of digital businesses and formulate an action plan for addressing this.** This applies to national sector regulators and regulatory bodies within provincial and municipal governments. Regulatory authorities must be held accountable by their shareholder ministries on the formulation and delivery of these action plans within a period of three years.
- **South Africa's legislative framework must be updated or amended to take into account the emerging opportunities and risks presented by 4IR technology application.** The 4IR not only requires new approaches to regulation but also creates frictions with current regulatory and legislative frameworks that need to be resolved. These frameworks – designed to fit a 3IR world – need to be harmonised with emerging trends and safely manage the use or deployment of these technologies in businesses, innovators and consumers. The DCDT and 4IR committee of South Africa's parliament can, in carrying out its work, advise line ministries on legislative gaps that must be closed to adequately enable the application of new technologies while protecting individuals. This can be undertaken over the next five years.
- **South Africa's cyber security policy must urgently be updated to take into account the growing volume of activities and risks expected in the digital economy.** South Africa's National Cybersecurity Policy Framework was developed in 2015 and is now potentially out of date given the fast-changing nature of the digital world. The DCDT must support South Africa's Justice Cluster to evaluate the relevance of the National Cybersecurity Policy Framework to the digital economy and identify gaps which must be addressed. This should be undertaken as a priority in the next year.

Outcome 4: Different regulatory authorities collaborate and harmonise policy and regulatory approaches and strategies. The nature of digital businesses is such that they span multiple sectors – technology is being applied in various sector domains. The application of digital technologies in business therefore suffers from regulatory overlap, where a business may be responsible to multiple different regulatory authorities with no one main regulator responsible for that business's operation. As one example, the case study below explores this issue of regulatory overlap in the newly emerging drone economy.

Case study 9: Regulatory overlap in the drone economy

The global drone economy is growing rapidly as unmanned aerial vehicles are being used across a number of use cases including healthcare, large area disinfection, security and crime fighting, agriculture, urban planning, construction planning, infrastructure development, passenger transport, retail and logistics, food delivery, defence, emergency responses, disaster relief, mining, insurance and the creative industries, among many others. In South Africa, the recent formation of the Drone Industry Council is a positive sign of the local growth of the drone economy. However, the scaling of this economy is being severely constrained by a number of regulatory bottlenecks. Drone operators are subject to the following regulatory stakeholders:

- The South Africa Civil Aviation Authority and the Department of Transport: The National Civil Aviation Policy states that the regulation of remotely piloted aircraft systems should remain the responsibility of the SACAA which drone operators are licenced by
- The Independent Communications Authority of South Africa and the Department of Communication and Digital Technology: the Broadcasting and Telecommunications Act requires that any communications link, including those on drones, must be registered with ICASA

- The Department of Trade, Industry and Competition and National Treasury: the import and export of drone components are regulated by the dtic and covered by the Customs and Excise codes.

As a result, there is no single government entity responsible for the scaling of the drone industry and a number of regulatory obstacles to this scale have emerged. This includes the lack of a drone registry that links the broadcasted drone ID with an owner operator licensed by SACAA, a severe backlog in SACAA capacity to inspect drone operator applications for new drones and a siloed and lengthy compliance process for drone operators, lengthy clearance processes for imported drones and components, and no tiered regulatory requirements for drones with different sizes and risks.

There will be many instances where competition, data, consumer protection and sector regulators will have to work together to create a streamlined regulatory framework. This will require the following actions:

- **Establish inter-governmental coordinating mechanisms** among regulators with a common interest in scaling digital business. For example, regulators in the financial sector created the Inter-governmental Fintech Working Group (IFWG) to jointly explore the regulatory impediments to fintechs in South Africa and implement co-created regulatory solutions. In the case of the digital economy, a number of regulators will need to join together in a similar fashion to scale other kinds of digital businesses. For the drone economy, this may include DCDT, ICASA, SACAA and dtic. For other kinds of digital businesses, such as digital platforms, this may include dtic, DCDT, the Competition Commission, and a number of sector regulators such as the Department of Transport and Department of Tourism to begin with. This should be completed within a year.
- **Develop a methodology for measuring the size and nature of the digital economy.** South Africa currently cannot account for the size of the digital economy or its compositive activities in its system of national accounts and statistics, and therefore has no way of accurately measuring how the digital economy is changing or impacting the rest of the economy. The DCDT must partner with Statistics SA to develop a methodology for accurately measuring the size and nature of the digital economy going forward. This must be undertaken within a year.
- **Establish and execute national strategies for the development and application of digital technologies in priority domains.** The inter-government coordinating mechanism must formulate and the execute national strategies for the development and application of emerging technologies such as AI, IoT and drones to solve South Africa's development challenges and with clear responsibilities among different government departments. This can be undertaken within three years.
- **Develop agile regulatory frameworks and innovation facilitation tools** such as regulatory sandboxes and innovation hubs to promote investment in and scaling of digital businesses. This should be executed over a period of five years by the inter-governmental coordinating mechanism within the priority focus areas identified in this Masterplan.

4.4. Innovation and competitiveness

For the period 2007 to 2017, South Africa's competitiveness has been on a decline as depicted in Global Competitiveness Index (GCI) drop to 67th from 44th, and the Global Innovation Index (GII) drop to 58th from 38th position (NACI, 2019)¹⁰⁹. To compete effectively in the global digital economy, and trade in unique and locally invented digital and ICT technologies, South Africa needs to sharpen its innovative edge and intensify its contributions to scientific, digital and technological advancement globally, regionally and nationally. This will

¹⁰⁹ NACI, 2019. South African STI indicators, Pretoria: National Advisory Council on Innovation.

require higher investment in research and development, efficient use of existing resources and financing schemes, and effective and inclusive commercialisation activities. The critical enabler of innovation and competitiveness can ensure that **South African businesses are empowered to create local digital products and services that can be exported globally**. The following outcomes and actions, along with the required stakeholders and timeframes, indicate how the objective will be achieved.

Outcomes	Actions	Timeframe
There are innovative financing schemes and reforms that enable businesses to create digital products and services	• Map the innovation funding process for digital innovations from R&D to final launch	1 year
	• Reform South Africa's IP policies and patent grant system	1 year
	• Bolster R&D financing schemes with a centralised co-ordinating body	3 years
	• Nurture alternative and innovative start-up financing schemes	3 years
	• Cultivate grass roots innovation schemes	3 years
There are commercialization activities that support and enable transformative businesses to scale, market and trade globally.	• Create public-private deal making teams	1 year
	• Fast-track international marketing and investor engagement in key source markets	3 years
	• Mobilise digital, ITO and ICT companies to participate in export market opportunities	5 years
	• Scale and promote work-from-anywhere digital platforms	5 years
There are smart incentives and enablers that ensure global competitiveness and job creation.	• Scale-up the dtic's GBS incentive scheme	1 year
	• Provide financial and non-financial reshoring and right-skilling incentives	1 year
	• Optimise existing special economic zones, innovation hubs, industrial and technology parks and youth technology facilities	3 years
	• Provide standardisation ranking and pre-testing initiatives for digital products and services that are exported	3 years

Outcome 1: There are innovative financing schemes and reforms that enable businesses to create digital products and services. As such, the development and invention of home-grown and locally produced digital solutions that solve economic, social and infrastructural problems in South Africa should be nurtured, funded and promoted. The actions required to achieve this outcome are:

- **Map the innovation funding process for digital innovations from R&D to final launch** to understand areas of overlap and how funding in one stage can support funding in another. Notably, this will enable various financing schemes, investors and funders to pool resources (financial and otherwise) and provide funding, at scale, to inventive and revolutionary digital products and services that create real impact. This has already been implemented, to some extent, by the Department of Science and Innovation (DSI) and should continue with lead co-ordination from DCDT other stakeholders with a view to being completed within one year.
- **Reform South Africa's IP policies and patent grant system** to be more accessible and to foster innovation. By enhancing the implementation of the Company and IP law, South Africa can achieve the dtic's objectives of "creating a fair regulatory environment that enables investment, trade and enterprise development in an equitable and socially responsible manner" and "facilitating the transformation of the economy to promote industrial development, investment, competitiveness and employment creation. As such, the Companies and Intellectual Properties Commission (CIPC) is already migrating South Africa's IP regulatory system from a depository to a search and examination system which should be complete within the next three years. This initiative should include collaboration and partnerships with DCDT, the Department of Science and Innovation and the dtic.

Bolster R&D financing schemes with a centralised co-ordinating body that encourages businesses to develop problem-solving digital solutions. Importantly, these digital products and services can realise the dual goals of solving critical economic, social and infrastructural challenges and then exporting these solutions to other countries to help them address the same issues. Already, the DCDT in collaboration with the International Telecommunication Union (ITU) is working towards operationalising the African Centre for Digital Transformation which aims to address the lack of coordination and integration of the innovation ecosystem. In addition, the DSI has created the Converging Technologies Platform (CTP) that is designed to grow and strengthen existing nationally co-ordinated research and innovation programmes in a range of areas such as blockchain (South African National Blockchain Alliance), artificial intelligence (Centre for Artificial Intelligence Research), additive manufacturing (Collaborative Programme in Additive Manufacturing), IoT (IoT factory), cybersecurity, quantum computing, robotics, and photonics. As such, the CTP aims to draw on these nationally coordinated programmes to support identified application areas in healthcare, mining, agriculture, and other key vertical industries. The CTP, and other R&D schemes, should be bolstered and broadly implemented within three years.

- **Nurture alternative and innovative start-up financing schemes** for start-ups, entrepreneurs and SMMEs. As such, there are already non-profit organisations such as the South African Business Angel Network that are dedicated to facilitating and growing angel investing in South Africa. This includes seeding angel groups/projects in major economic hubs, lobbying for regulatory improvements and capacity building backed by research and accreditation initiatives. Therefore, this action should be accelerated by DCDT and the Department of Science and Innovation in collaboration with SABAN and other innovative financing schemes over the next three years.
- **Cultivate grass roots innovation schemes** for township and rural economies. Enabling youth and entrepreneurs in tier 2 and tier 3 cities and towns to innovate and invent digital and ICT products will not only uplift their lives but the communities and people that surround them. Initiatives of this nature can help South Africa to address socioeconomic challenges and developmental issues by integrating digital and township economies. TIA already has a grassroots innovation programme in place and has launched the Scale Out for Impact (SOFI) Programme that aims to build partnerships between innovative UK small and medium enterprises and suitable South African innovators or enterprises. Notably, this includes the use of digital technologies and social technology platforms, such as the Internet of Things, artificial intelligence, analytics, virtual reality and blockchain. These grassroots schemes can be scaled with DCDT support over the next three years.

Outcome 2: There are commercialization activities that support and enable transformative businesses to scale, market and trade globally. The global business services (GBS) sector, through its NPC industry intermediary BPESA, has a growth strategy in place which aims to expand South Africa's share of international digitally traded services. This plan touches on a refreshed value proposition, a new approach to offshore market growth and higher levels of domestic market engagement to rebuild the local economy. Moreover, it fast tracks the roll out and usage of digital and cloud technologies, inclusive business growth, innovation, youth job creation and a clear and overarching plan for economic and social transformation. The actions required to achieve this outcome are:

- **Mobilise digital, ITO and ICT companies to participate in export market opportunities** to support the expansion of South Africa's digitally traded services. As such, various players in South Africa's well-developed domestic ICT sector should be mobilised to export and trade their digital and ICT services to the international marketplace. The country is increasingly emerging as an IT outsourcing (ITO) destination of choice with the ability to scale capabilities in a range of exportable services such as data storage, artificial intelligence, machine learning, blockchain, cybersecurity and cloud engineering. This

must be undertaken by DCDT along with BPESA, InvestSA, the DSI, the PPGI ICT working group and the BBBEE ICT Council over the next five years.

- **Fast-track international marketing and investor engagement in key source markets** that hold the greatest potential for digitally traded exports from South Africa. This includes appointing intermediaries and influencers on the ground in key markets such as Australia, Canada, Europe, the United Kingdom and the United States. Moreover, these initiatives should be backed by sustained virtual and physical marketing, investor engagements and inward/outward trade missions to sell South Africa as a delivery location of choice. This should be undertaken by DCDT along with BPESA, InvestSA and dtic over the next three years.
- **Create public-private deal making teams** that match-make and facilitate investment and partnerships with global buyers of tradeable services. Backed by the aforementioned action of international marketing and investor engagement, these teams should take a very strategic, co-ordinated and deliberate approach to identify opportunities and facilitate one-on-one interactions between potential buyers in key source markets and suitable service providers in South Africa. This must be undertaken by DCDT along with dtic, InvestSA, BPESA and the Department of Home Affairs within the next year.
- **Scale and promote work-from-anywhere digital platforms** that facilitate outcomes-based work for South Africans in townships and rural villages. Until digital access and the complexities of work-from-home are addressed, workers or freelance agents can tap into and receive project and short-term contract-based work from strategically located community hubs or micro centres in tier 2 and tier 3 towns and cities. These micro centres and virtual outsourcing models can enable agents, workers and freelancers to receive pay-for-work gigs from any location and via various digital and gig economy platforms. This must be undertaken by DCDT along with private sector digital platform providers, provincial economic development agencies, the DSI and BPESA over the next five years.

Outcome 3: There are smart incentives and enablers that ensure global competitiveness and job creation. By enabling and influencing key business and economic levers that include incentive schemes, special economic zones (SEZs) and industrial parks, South Africa can compete effectively on the global digital stage. The actions required to achieve this outcome are:

- **Scale-up the dtic's GBS incentive scheme** to attract a broader set of international investors and create more digital and ICT jobs. The dtic's existing GBS incentive scheme covers IT-enabled services, which would include digital and IT outsourcing, but is heavily oversubscribed from existing BPO and shared services players. Scaling up job creation in the adjacent digital and IT sectors will require incentives for investors to consider South Africa as a delivery location for digital and IT outsourcing, with a larger quantum of funds to be allocated to the incentives. This must be undertaken by DCDT as the co-ordinator of the Masterplan along with the dtic which owns the incentive scheme, the PPGI ICT working group, National Treasury and relevant government stakeholders in the next year.
- **Provide financial and non-financial reshoring and right-skilling incentives** to bring digital and ICT work back to South Africa. This work (which includes tasks like software development, application development, data analytics and data science) has been outsourced to foreign markets by local enterprises and organisations and has the potential to create thousands of jobs. By providing financial and non-financial incentives (including B-BBEE score card points) while simultaneously supporting right-skilling programmes, South Africa could bring significant digital and ICT work back onshore. These right-skilling programmes could include funding support and incentives for companies to develop the right/best-fit skills that they specifically need to effectively reshore work back to South Africa. As such, they could be interlinked to large scale integrated work place learning solutions as proposed in the Skills for Work section of this plan. This must be undertaken by DCDT along with the dtic, the PPGI ICT and GBS working groups, and BPESA within the next year.

- **Optimise existing SEZs, innovation hubs, industrial and technology parks and youth technology facilities** to enable inclusive growth of digital businesses. This includes physical and virtual SEZs, hubs, parks and centres of excellence for small businesses and entrepreneurs to thrive, build and launch digital products and services for domestic and global consumption. Notably, the DSI is already providing investment support for the development of a technology platform to match people with various innovation hubs and youth technology facilities that offer support and skills. This platform is user-focused and designed around the service offerings of various hubs and facilities. Conversely, industrial parks need capacity to implement new digital technologies in order to participate in the digital economy. More specifically to raise awareness and introduce digital decision-making technology solutions; build operational efficiencies through introduction of IoT, artificial intelligence, big data and machine learning applications; and promote technical skills and address workforce training transformation. This requires collaborative action between DCDT and the dtic, the DSI, The Innovation Hub, Technopark Stellenbosch, Highveld Techno Park (HTP), Innovation Hub Science Park (IHSP) Pretoria, Coega Technology Park (CTP) Port Elizabeth, and the Cape Growth Initiative over the next three years.
- **Provide standardisation ranking and pre-testing initiatives for digital products and services that are exported.** Oftentimes digital and ICT technologies that are exported are subject to global standards, compliance and regulations that require certification. These certification and standards auditing processes can be fairly cost-prohibitive for SMMEs. As such, innovation hubs, industrial and technology parks could provide much-needed assistance to SMMEs to rank and pre-test their digital services and products against internationally accepted standards and certifications. This can be undertaken as part of the optimisation of innovation hubs, industrial and technology parks over the next three years.

4.5. Government digitization

With expansive and diverse departments, agencies and public institutions, the Government of South Africa has within its means the ability to directly stimulate and impact the country's knowledge-digital economy. This includes the consolidation of back-end systems and processes to bring about better front-line service delivery to citizens. It also includes the digitization and pooling of government data to improve decision-making and streamline inefficient processes. The box below discusses the mechanisms and value of shared data and insights across government.

Box 2: The value of digitized government data

Government institutions should employ shared data standards and make use of shared data infrastructure.

These standards should incorporate non-traditional, new and foreseeable sources of data and should be designed in accordance with regional and international best practice. These standards should form part of a broader process in the design of data governance structures that detail expectations for interoperability, process design and definition, and the roll-out of end-to-end systems. This includes promoting the establishment of de-identification protocols and driving the adoption of low cost, open digital infrastructure that can be supported by local innovators. By adopting shared standards in all government departments, the consolidation of this data will be more feasible. The envisaged roll-out of a shared storage and high-performance computing facility for government should be fast-tracked to support the establishment of a single point of access for the public. Likewise, the design and deployment of a singular API should be prioritised.

Mechanisms that improve visibility of this data and highlight its relevance can help to ensure its full value is realised. The substantial breadth of government data can create challenges in navigating appropriate sources. Analysis of the value of different government datasets and a system of classifying these into an index could help guide users in identifying and accessing sources that meet their needs. By drawing on national research objectives, data sources that can facilitate research in critical areas can be highlighted. The process of standardising and consolidating government data will furthermore be complex and time intensive. Identifying and prioritising strategically relevant sources and systems will ensure the public has access to the most valuable data first.

Formally promoting the use of shared data in government can support national planning and deepen a ‘data-first’ mindset. While data governance mechanisms are critical in promoting minimum standards for sharing practices and processes, additional activities should support the proactive usage of shared data. This includes the integration of open data objectives in employee and department KPIs as well as requiring government entities meaningfully engage with the open government data stores when developing medium and long-term plans. This will be critical in deepening norms of evidence-based policy making.

Therefore, the objective of government digitization is for **government to directly stimulate job creation and improve citizen-centric services through its process of digital transformation by becoming a source of demand for digital and ICT products and services.** The following outcomes and actions, along with the required stakeholders and timeframes, indicate how the objective will be achieved.

Outcomes	Actions	Timeframe
There is growth and escalation in outsourced or co-sourced government contact centres.	- Consolidate existing contact centres through the President’s hotline - Scale up government frontline citizen care and support services.	3 years 3 years
There is a mass digitization project of back office and paper-based government processes and functions.	- Create digital bureaus that enable youth and SMMEs to clean and analyse government data - Digitise manual records across key government departments.	2 years 2 years
There is a measured, consistent and ethical focus by government to procure digital services and products from SMMEs.	- Expedite the development and finalisation of the Public Procurement Bill - Provide performance incentives for local procurement of ICT tools, software and devices - Develop a central ICT government procurement system - Develop an ICT payment monitoring system - Expedite the implementation of e-government services	1 year 3 years 3 years 5 years 2 years

Outcome 1: There is growth and escalation in outsourced or co-sourced government contact centres.

Globally, many governments have taken the bold step of outsourcing their voice and non-voice citizen delivery services or creating co-sourced and shared service centres that retain and create jobs. The time has come for South Africa to make this happen. The actions required to achieve this outcome are:

- **Consolidate existing contact centres through the President’s hotline** to create a single point for citizen support and aggregate government demand for contact centre services across the three different spheres of government (local, provincial and national). This will enable centralised front and back-office operations that break down siloes, eliminate redundancy and create efficiencies. This must be undertaken by DCDDT with support from the Project Management Office in the Presidency and other relevant stakeholders over the next three years.
- **Scale up government frontline citizen care and support services.** As more efficiencies are introduced, and citizen services are optimised, this will create significant savings that can be rechannelled into more development-directed and job creation programmes for South Africa. However, to ensure that there are no job losses, the government can enable these efficient, citizen-centric services to be delivered from co-sourced or shared services centres with labour regulations that protect the rights of workers. This can be achieved over the next three years.

Outcome 2: There is a mass digitization project of back office and paper-based government processes and functions. By digitally transforming local, provincial and national departments, South Africa can address

youth unemployment and enterprise development while ultimately providing downstream opportunities. The actions required to achieve this outcome are:

- **Create digital bureaus that enable youth and SMMEs to clean and analyse government data.** Black-owned enterprises with proven ICT experience will be contracted to employ unemployed youth and create digital bureaus. Training will be provided enabling youth to be employed on the project and gain relevant work experience. The training provided will combine technical digital skills training with soft skills and work-readiness training, improving the employability of youth. Enterprises will provide data cleaning and digitisation services to government departments. This action is already being undertaken by DCDT along with the PPGI ICT working group, the Department of Public Works and ICT and government stakeholders and will see the creation of 9 digital bureaus over the next two years.
- **Digitise manual records across key government departments.** The aforementioned 9 digital bureaus will create sustainable employment opportunities in the form of 10 000 new jobs for young black graduates by digitizing manual government documents. As such, there are three government cluster areas that will pilot this mass digitisation project including the Justice Cluster (Policing, Justice and Correctional Services), the Social Cluster (Health), and the Planning Cluster (the Deeds Office). This action is already being undertaken by the PPGI ICT working group, the Department of Public Service and Administration (DPSA), the relevant departments/clusters identified for the pilot programme and other ICT stakeholders. GTOC and the State Information Technology Agency (SITA) are being onboarded to integrate with the existing initiatives. The project has been gazetted and phase two is in process which includes the formalisation of a business plan and setting up the digital bureaus culminating in the digitization of records over the next two years. This provides the basis for the pooling and analysis of electronic data across government departments.

Outcome 3: There is a measured, consistent and ethical focus by government to procure digital services and products from SMMEs. Directing opportunities towards South African businesses can help support the emergence of broader digital skills and business base in South Africa. This outcome is a critical mechanism for supporting the emergence and scaling of local businesses and the use of digital technologies. It will further aim to present businesses with the opportunity to deploy and curate their service offering while supporting the government in achieving its digitisation objectives. The actions required to achieve this outcome are:

- **Provide performance incentives for local procurement of ICT tools, software and devices** to government agencies and departments. Ongoing discussions requiring that a proportion of the total value of ICT procurement be allocated to local SMMEs should be mandated and incentives should apply against these requirements. This action must be executed by DCDT, SITA and Department of Cooperative Governance and Traditional Affairs over three years.
- **Expedite the development and finalisation of the Public Procurement Bill** that will enable procurement of local innovation and increase commercialisation of local IP. The public procurement bill proposes loosening the rules to facilitate good purchasing practice and black economic empowerment while strengthening mechanisms of contract management, including mechanisms to incentivise private enforcement of contracts, to ensure delivery of goods and services purchases and build the capacities in South African businesses. There is already a draft bill that has been published for public comments by National Treasury. However, it needs to be reviewed to more clearly take into account the procurement of digital services and products from SMMEs and effective and transparent regulatory oversight. This process should be expedited over a period of one year.
- **Develop a central ICT government procurement system** to manage technical scoping of required digital and ICT support within government. A principles-based, strategic, and developmental procurement system will centralise information and automate verification, digitize and centralise tender information and complete the procurement process digitally. This action will improve the competitiveness in the tender and procurement process, increase transparency of procurement and contribute to digitizing interaction between South African business and

government. It will further increase the cost effectiveness of ICT procurement and promote the South African ICT sector. This action must be executed by DCDT and SITA within the next three years.

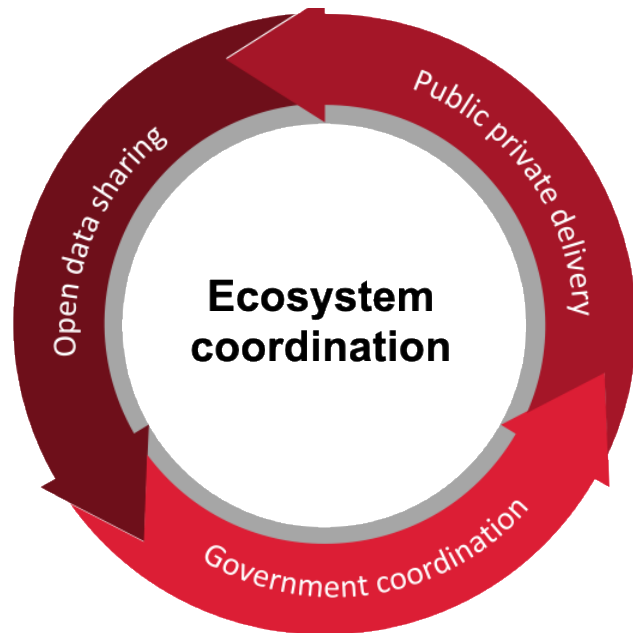
- **Develop an ICT payment monitoring system** to ensure that government contracts to SMMEs are paid on time and without irregular spending. This action will ensure that South African businesses remain capacitated to deliver on their contractual obligations and promote their growth and development/ This action must be executed by DCDT and SITA within the next five years.
- **Expedite the implementation of e-government services.** The Department of Telecommunications and Digital Technologies gazetted the National e-government strategy and roadmap in 2017 which guides the digital transformation of public services in the country. The strategy aims to ensure that all South Africans can access quality public services and government information from anywhere at any time, reduce the cost of public administration and harmonise the policy environment and legislative framework to enable digital transformation. Several components of the strategy have been implemented but it is advised that this process is expedited over the next two years.

5. ECOSYSTEM COORDINATION IN THE DIGITAL ECONOMY

Putting in place the five critical enablers identified in the preceding section will require an enormous and collaborative effort across government, the private sector and labour. The complexity of the digital economy and the fact that it touches on every sector across the economy means that mechanisms for aligning stakeholders, coordinating actions and delivering implementation with appropriate resources and focus is an imperative.

This section sets out proposals for three areas where this ecosystem coordination must happen if South Africa is to successfully grow its digital economy inclusively. These areas are shown in the diagram below and elaborated on in the following sections.

Figure 18: Ecosystem coordination in the digital economy



Source: Genesis Analytics, 2020

5.1. Government coordination

South Africa will require a government-led coordinating mechanism that prioritises, allocates responsibilities and executes on nationally relevant digital strategies and interventions. This mechanism will ensure continuity and evolution of South Africa's ICT and Digital Economy Masterplan while creating the means for efficient and effective execution.

The proposed mechanism must overcome common collective decisioning complexities that coordinating entities in government face. These are the principles upon which this mechanism is designed:

- **A whole of government approach** to ensure that all relevant government entities are responsible for collective decision making and implementation of the programme of work required to realise the national imperative of digital empowerment. Providing for this allocation of responsibility across government will ensure that digital economy objectives and considerations are embedded across government operations and decisions.
- **Avoidance of duplication of efforts** where stakeholders might be striving to achieve similar objectives or outcomes along different avenues.
- **Improving efficiency and representation** by providing a single platform that represents not only the public sector, but also the private sector, donors, civil society and others.

This calls for an overarching convening and coordinating function within government with the executive mandate and capacity to deliver this function. The Minister of DCDT will be convening an Executive Oversight Committee (EOC) to play the oversight role for the implementation of this Masterplan. The EOC will comprise of high-level representatives from government, private sector and labour to advise the Minister on the implementation of this Masterplan and monitor its progress.

In addition, a more regular forum for addressing implementation issues across government stakeholders will be useful. A number of options are presented to deliver this function:

- i. The Minister of DCDT can convene an inter-governmental digital economy forum, co-chaired by the Director General of DCDT and the head of the project management office (PMO) in the Presidency which is responsible for, among other things, working across government to unblock regulatory obstacles and assist with the implementation of the President's Youth Employment Intervention. This proposal has two considerable benefits. Firstly, it is appropriate that the Minister of DCDT should convene this group given that DCDT has been given the mandate to deliver the country's 4IR and digital economy objectives. Secondly, having the PMO in the Presidency as a co-chair is useful to assist with collaboration required in other parts of government beyond DCDT's mandate. There is good precedent for this option in the way that the masterplan process has played out, with the dtic driving the process and the PMO in the Presidency acting as co-chair to assist with coordination among other government departments.
- ii. The President's Commission on the 4IR (PC4IR), hosted by DCDT, has already established a 4IR plan for the country which has contributed to the development of this Digital Economy Masterplan. The PC4IR requires implementation capacity and has a secretariat based in DCDT, and so could take on the implementation of this Masterplan within the scope of its work and responsibility.
- iii. The EOC can convene a number of sub-committees to drive implementation of specific aspects of the Masterplan and report back to the EOC on regular occasions. These sub-committees could be structured along the four digital economy big bets identified in this Masterplan, or along the five critical enablers identified that must be in place to support the big bets.

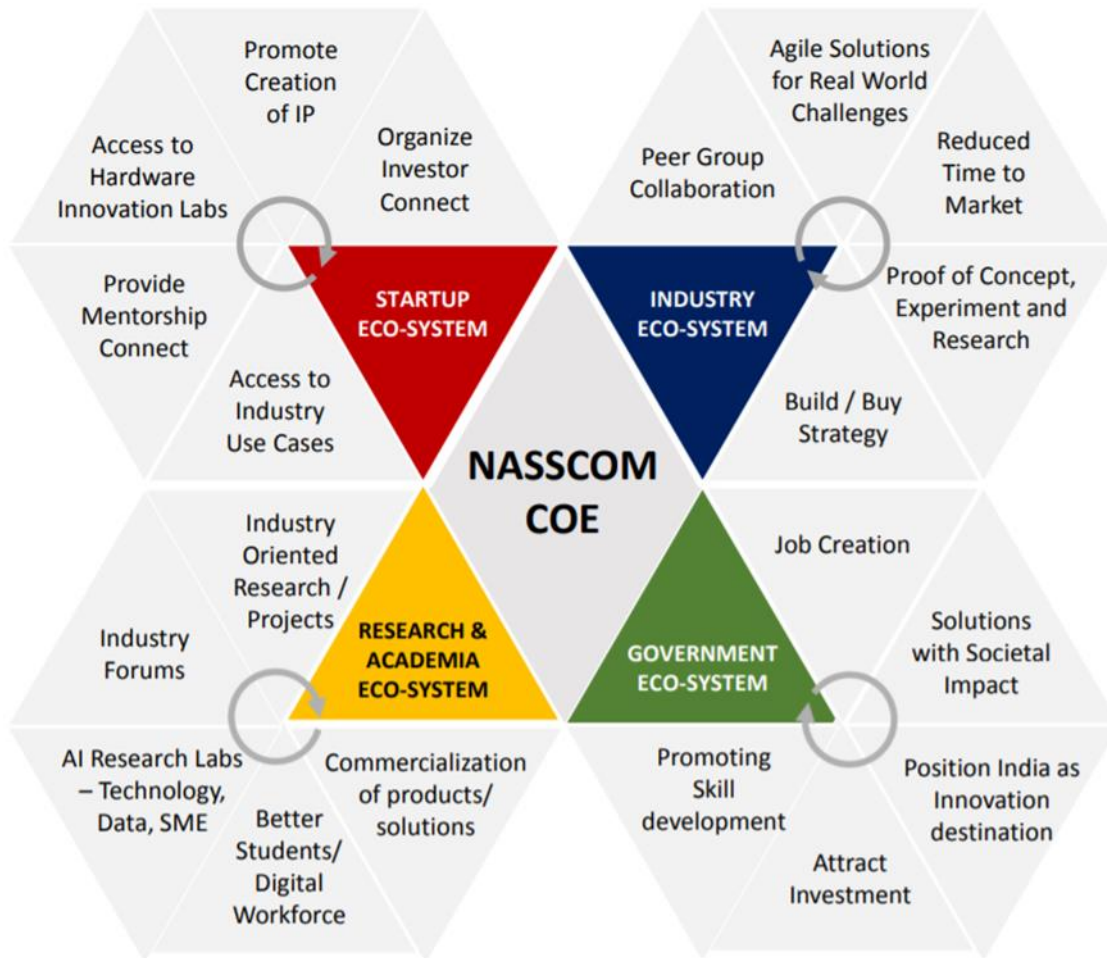
In addition to the options above, every national government department must appoint or hire a senior representative in a dedicated digital economy role. These representatives will collectively make up a government digital economy forum, meeting quarterly, to align priorities between government departments, ensure no duplication of effort, and promote knowledge sharing and collaboration across the government. The digital economy representatives must also be primarily responsible for scoping out and driving implementation of digital projects within their respective government department, since digital technologies and their applications hold immense potential for every sector and government entity in South Africa.

5.2. Public private solutioning

There are multiple players across the public, private and civil sectors that need to come together for the identified digital economy big bets to be realised. Within each of the digital economy big bets, however, there are many different stakeholders that need to be coordinated for the identified opportunities to be realised and scaled significantly. In other countries that have successfully pulled this kind of coordination off, there are specific institutions that play this coordinating role. Two examples are the centres of excellence (CoE) run by the National Association of Software and Service Companies (NASSCOM) in India – one on AI and Data Science and the other on IoT and AI. What makes these CoEs special is the facilitating role they play in connecting stakeholders together for particular technology applications in specific domains. This is demonstrated in the diagram below.

South Africa must replicate the formation of adequately funded ecosystem convening institutions if it is to achieve the same impacts from digital economy development as countries like India. This can be achieved by channelling government funding for digital economy development - including digital infrastructure deployment, digital skills development and digital job creation initiatives – through special purpose vehicles (SPVs) that can adequately convene and coordinate the necessary private sector and civil society players to execute these projects. These SPVs should be set up as not-for-profit entities that work closely with government to identify the right stakeholders for execution, manage the flow of funding, monitor implementation and ensure technical quality.

Figure 19: The NASSCOM Centre of Excellence coordination model



Source: National Association of Software and Service Companies, 2019.

5.3. Open data sharing

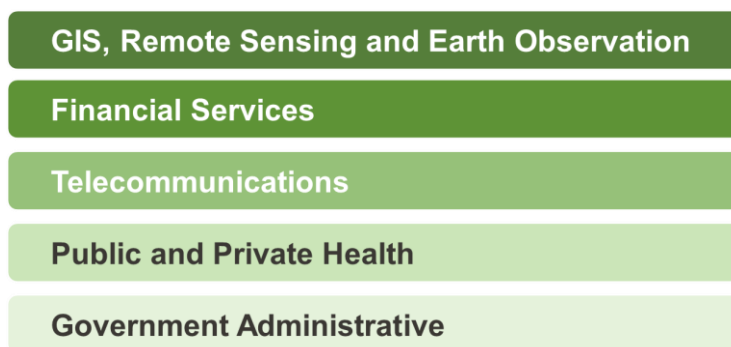
Data must become a national asset used to accelerate innovation for economic and social good. This recognises the core role data plays in the digital economy and its subsequent role in enabling the public and private sectors. A well-functioning data ecosystem will help South Africa reap its national data dividend by supporting the emergence of new products and services, enhancing planning and intelligence, and deepening national competitiveness.

Executing on and scaling the big bets detailed in this masterplan requires the availability of a range of high-quality data sources often contained in independent silos. Data is an asset owned by businesses and individuals. This ownership means it is often protected and put to use for a narrow set of commercial purposes.

Creating mechanisms for sharing this data can lead to innovations and the emergence of new products and services. For example, research into AI enabled diagnostics requires access to individual data often stored across different institutions, while overlaying data from banks and satellite imagery can support the design of new products and services for farmers or be analysed to understand current and future farmer wellbeing.

South Africa's data ecosystem requires facilitation to support the growth of widely accessible domestic data stocks. Achieving the two objectives of deeper stocks and improved flows will unlock large volumes of high-quality data. Increasing the stocks of available data should be achieved by deploying new and alternative solutions for data acquisition, transforming existing paper-based or analogue information into machine readable formats, or purchasing new sources from service providers. However, increasing the volume of data is not enough - improving the flows of data to enhance open access and sharing are needed to overcome boundaries between data siloes.

While effective facilitation should support the maturity and performance of the entire data ecosystem, there are a number of clusters that are a priority. These cluster are detailed below and host rich pools of data generated directly or as a by-product of business and government operations, and which when combined offer tremendous value through new insights.



A well-developed data ecosystem would see shared use within and between these clusters. Achieving this would mean these sources could be used and re-used for a broader range of functions and overlaid with other sources to yield its analytical potential and unlock the latent and unutilised value that data siloes prevent.

A coordinated and formalised approach to enabling the data economy is a critical first step. The cross-cutting nature of this ecosystem requires a consolidated approach that engages both the public and private sectors. An advisory council or working group with representation from the public and private sector would be key in supporting the development of a coherent approach to data standards, governance, regulatory frameworks and others. This would be effectively paired with the design and roll-out of a national data policy and strategy oriented around national objectives of enhanced domestic stocks and flows. This policy and strategy would be critical in harmonising the approach to these objectives with current regulatory and legislative frameworks.

While a coordinated approach can bring coherence to national efforts, some mechanisms can be focused on improving the availability of data or enabling data sharing. These mechanisms are detailed in the following two sections.

Increasing Data Stocks

Timeous and high-quality earth observation data is unaffordable for South African innovators. While there are a range of open sources of satellite imagery, most of these lack the resolution and spectrums needed by innovators or are only available for historical periods. SANSA currently has a high-quality earth observation feed provided by the SPOT satellite. SANSA has also deployed a data cube which allows users outside of

SANSA to run computationally demanding analysis on this data without their own infrastructure. However, access to this data is contractually limited to government entities, private sector players supporting government, or research.

Nationally owned satellites are a potentially cost-effective source of earth observation data. Local industry has the capacity to design, develop and manage South African owned satellite assets that can be used to capture and transmit earth observation data. The falling size and costs of satellite solutions means this has the potential to be more sustainable and cost-effective way of increasing the data available to SANSA specifically and South Africans generally. By supporting the launch of South African owned Low-Earth Orbiting (LEO) cube satellites, significant innovation could be unlocked, response time to disasters improved, and national autonomy and data integrity secured. SANSA therefore has the opportunity to expand its footprint as the core GIS and Earth Observation data custodian in South Africa. SANSA would therefore take the lead in defining access controls based on the sensitivity of available sources. These activities should be paired with support for the continued expansion and enhancement of its cube offering.

Case study 10: Astrofica Technology

Astrofica Technologies is a local satellite technology services provider. The firm has proven capacity in the design, production and management of hyper-spectral small satellites. These 'cubesats' weigh between 3kgs and 10kgs and can carry instrumentation for the capture and transmission of earth observation and other scientific data. The firm's cubesat can be easily adapted to perform a range of additional functions and carry additional instrumentation.

Drones are another source of remote sensed data which should be unlocked in South Africa. Drones can be used in more targeted areas of remote sensing to support specific industries or operations. South Africa has a highly committed drone council aimed at overcoming blockages to the scaling of this industry. These blockages are detailed in preceding elements of the masterplan. Resolving these blockages is a priority given the significance the industry could play in creating new sources of data

Strategically critical sources of local data should be available for national planning regardless of source. In particular this relates to data on the scale, quality and location of natural resources. Given the importance of this source it should be co-owned between the private and public sector if the private sector has committed funding to its acquisition.

Improving Data Flows

Promoting data sharing within and between clusters can be facilitated by a variety of technical and non-technical mechanisms. Technical mechanisms such as data standards and the deployment of secure APIs provide for easy access. Incorporating and designing access controls and security are key in ensuring that data that is shared is done so securely and accessed solely by those intended. Non-technical mechanisms are wide-reaching. This includes elements of data governance frameworks and training that promotes a data first mindset and approaches to data management and oversight. These activities enhance institutions' willingness and capacity to engage in sharing. A well-functioning regulatory and legislative framework is equally critical to ensuring that institutions sharing data have confidence that usage of data beyond agreed to purposes will incur swift corrective action.

Institutions designed to facilitate data sharing are an innovative mechanism for supporting enhanced flows for public and private benefit. These data institutions can take many forms and are known by many terms. For example, data collaboratives are repositories of private sector data used to support the public sector, while data trusts are entities designed to ensure that a repository of pooled data is used in accordance with the objectives and principles required by its stakeholders. These institutions are objective custodians of data that

are contractually and legally obliged to ensure it is used in accordance with agreed purposes and by agreed parties. Intelligent institutional design and an enabling legislative framework can help to ensure that data providers are confident that the data that they share is not used in a way that can disadvantage the provider.

Government should support the emergence of data institutions that operate within and between clusters. These institutions may be founded by the private sector, public sector or a combination of both. Supporting the emergence of these institutions in strategically critical areas could be facilitated by innovative challenge funds that target the objective of data sharing.

These technical and non-technical mechanisms have application in both the public and private sector. Although these mechanisms are cross-cutting, there are nuances to their appropriateness and scope of application. The following details how these mechanisms can be used to promote data sharing in the public and private sectors.

Facilitating access to data for good

Sector regulators should take the lead in supporting data sharing. Regulators should be empowered to drive data sharing objectives and formulate industry data standards. While empowering regulators to promote data sharing gives them the capacity to do so, including these objectives as an element of their mandate can motivate execution on this capacity. Regulators should be cautious not to be heavy-handed in their approach and should initially identify narrow areas of opportunity or require the standardisation of a narrow range of priority data sets and sources. Regulators can drive business to enhance processes for accessing data by deepening the granularity of reporting required from business. Achieving this will require businesses roll-out protocols for effectively accessing and communicating this data.

A successful data trust pilot can help to identify the complexities of cross-cluster data sharing and confirm the feasibility of safe execution. This pilot could be oriented around supporting the current and post-COVID recovery efforts. For example, the overlay of a range of private and public sector data can be used to identify and understand pockets of need and enable precision welfare. This trust should be designed to restrict access to dedicated and contractually bound analysts and have a clear mandate in terms of purpose. It could furthermore have a finite lifespan. The pilot would help to identify the conditions required by the private sector for sharing. This might relate to participation in trust decisions, oversight of trust activities, return for support and the need for adjustments to legislative or regulatory frameworks. It could also relate approaches to data aggregation and de-identification, or others. The technical costs incurred for analysis, de-identification or aggregation should be onboarded by the pilot.

Case study 11: Linkedto

LinkedTo is a digital platform for organisations and individuals in the humanitarian relief space to coordinate their efforts, reduce inefficiencies and promote equitable distribution of resources to those in need with the following features:

- The provision of a searchable map via which the general public can find organisations working in the relief space within their area
- A registration page for community benefit organisations (CBOs), suppliers and donors to registration for an account
- A reporting page for CBOs to report out on the food relief activities they have undertaken, including date and location of activity.
- A 'user-only' view for registered CBOs, suppliers and donors to be able to view, search, and filter organisations currently captured in the database via the map or on a list

The Covid-19 lockdown has resulted in an exponential need for aid which requires humanitarian organisations and those who are not to scale relief efforts. Many more players are emerging in the response, with grassroots entities taking on the burden of supplying relief in underserved areas. This crisis has exposed inefficiencies, duplicated efforts and wastage within the relief space, in part due to the lack of coordination of efforts. As many new actors enter the space, as donations come from all sides, this crisis response has highlighted perhaps more than ever the need for improved communication and coordination to ensure greater efficiency and equity in the delivery of services and goods. There is great opportunity to harness technology to support such efforts. the opportunity for the sector to work together to improve the communication and collaboration of efforts in the entire ecosystem.

Support should be targeted at research into emerging approaches that maintain privacy while allowing analysis of data in independent siloes. While data sharing traditionally requires data be pooled into a shared repository, emerging methodologies can allow for analysis of this data without explicitly moving or sharing it. For example, federated learning is an emerging field that allows for an AI model to be built using data from multiple parties located in disparate siloes. The methodology and associated encryption layers mean participating parties only have a view of the model outputs and their own data – data remains securely under the custodianship of its owners. Some commercial entities globally are experimenting with this methodology within data partnerships to derive shared value of the outputs while avoiding the risk of sharing. Academics and institutions researching this technical alternative to sharing should be financially supported through grants and incentives to create local capacity to explore these solutions.

6. PRIORITY ACTION PLAN

This Masterplan has set out an ambitious amount of work that remains to be done to realise and scale the opportunities presented to South Africa in the digital age. Given the breadth of activity and stakeholders, and considering the cross-cutting nature of the digital economy, the ecosystem coordinating mechanisms proposed will be critical to delivering the actions required to realise the digital economy big bets identified in this Masterplan.

DCDT will be the lead co-ordinator for all of these actions as the custodian and government implementer of this Masterplan. Many of the actions identified are best implemented by the DCDT and its regulatory authorities given the department's mandate to drive digital economy development and the 4IR in South Africa. Where other partners in other government departments, or in the private sector or civil society are required, DCDT will play the important role of lead coordinator.

Given the scope of work that remains, prioritising effort and resources will be crucial. Fortunately, a number of the actions identified are already underway or are currently being planned for. This means that part of the work of the ecosystem coordinating mechanism will be monitoring projects that are ongoing, or getting planned projects implemented. In addition, a number of the proposed actions have clear implementation stakeholders identified but funding has yet to be secured. In other cases, the proposed actions do not yet have any clear implementation stakeholders identified to drive implementation as well as funding needing to be secured.

This categorisation of the proposed actions provides the starting point for an implementation plan stemming from this Masterplan. The actions are grouped into four categories depending on whether they are currently being implemented, have a clear implementation stakeholder identified or have funding secured. The work of the DCDT and its partner stakeholders in the private sector and labour will therefore be to **monitor** ongoing projects, **implement** planned projects, **fund** projects that require resources, and **plan** for projects that do not yet have resources or an implementation stakeholder. These actions are shown in the figures below.

Monitor

Fortunately a large number of the actions identified in this Masterplan already have implementation champions identified and are adequately budgeted for. DCDT and the EOC's first priority is to monitor how these actions are being implemented and provide support should any obstacles arise. The implementation champions for these projects should be invited to report back to the EOC or its implementation structures to provide updates on implementation progress. The list of actions which fall into the "monitor" category are provided in the appendix to the Masterplan.

Implement

Similar to the monitor category, there are a number of actions identified in the Masterplan which have implementation champions identified and are adequately budgeted for, but these actions have yet to be implemented. The role of DCDT and the EOC in these cases will be to support the implementation champions to begin implementation quickly. These stakeholders should also be invited to feed back to the EOC or its

implementation structures regularly to keep track of the status of implementation and its progress. The list of actions which fall into the “implement” category are provided in the appendix to the Masterplan.

Fund

There are some actions identified in this Masterplan which have a clear implementation champion identified yet which do not have funding to begin implementation. The role of the DCDT and EOC in this case should be to assist with the raising and identification of financial and human resources to fund these activities. While there are a number of actions identified in this Masterplan that fall into this category, practical delivery considerations require a priority selection based on an assessment of costs to implement and expected impact. The priority actions identified in this “fund” category are listed in the appendix to this Masterplan.

The implementation of the masterplan will be aided by the formation of a digital economy transformation fund to pool financial resources from the private sector’s enterprise development, supplier development and BBBEE equity equivalence programme spends. This is based on a model that developed from the automotive sector masterplan in South Africa. The Auto Industry Transformation Fund is currently being established after an agreement among the large OEMs to pool their supplier and enterprise development obligation under the BBBEE equity equivalence programme¹¹⁰ to execute impactful interventions to grow black-owned SMME participation in the export-oriented auto sector. Replicating this in the digital economy sphere will provide an opportunity to fund a number of the interventions proposed in this plan. With aggregated BBBEE spending, more impactful activities focused on empowering black-owned SMMEs operating in the digital economy and upskilling the millions of South Africans that need to be empowered to successfully participate in the digital economy can be funded.

Plan

There are some remaining actions identified in this Masterplan which have neither an implementation stakeholder identified nor funding secured. For these actions, the final leg of work for DCDT and the EOC will be planning to convene the relevant stakeholders that can play a role in implementation and identifying appropriate sources of financial and human resources. Again there are a number of action identified in this Masterplan that fall into this category, but the priority actions have been identified in the appendix to this Masterplan given the need to allocate scarce resources across a number of activities.

¹¹⁰ The equity equivalence programme is an initiative with the dtic to allow multinational companies investing in South Africa to earn BBBEE points without needing to divest ownership of the entity by investing in enterprise development and supplier development programmes.

7. IMPACT OF IMPLEMENTING THE MASTERPLAN

The purpose of the detailed actions set out in the preceding section is to create an enabling environment for the four digital economy big bets identified at the beginning of this Masterplan to scale inclusively. By creating this environment, the implementation of the Masterplan will achieve its objectives by supporting the emergence and growth of digital industrial applications that create inclusive growth, job creation and transformation.

Inclusive growth



or 4.5% of GDP
each year

Job creation



created over
10 years

Transformation



and 500 000 people
reskilled in 5 years

7.1. Inclusive growth

The digital economy can contribute upwards of at least R200 billion or 4.5% to South Africa's GDP each year. This is based on three areas of impact that the digital economy big bets can create: improved productivity in the domestic economy, improved global competitiveness and exports, and the creation of new industries.

Improved productivity in the domestic economy - the adoption of digital and other technologies across the various sectors in the economy are giving rise to cost reduction and productivity enhancing effects with a concrete impact on economic output:

- The value add to industry as a result of such productivity effects across the domains of the economy was estimated to be in excess of R2 trillion over a 10 year period¹¹¹, largely underpinned by IoT and AI technology as well as platforms.¹¹²
- This is expectedly driven by the **financial services sector**, nearly double the second highest contributing industry sector. Tech adoption in this domain can be expected to be a result of fintechs expanding access to financial services through digital channels; blockchain¹¹³ which effectively addresses fragmentations in systems and organisational structures; and robotics, to deliver advisory services, particularly as banks begin to evolve.¹¹⁴

¹¹¹ Estimated value add covers the period 2017 to 2026

¹¹² Accenture (2019), *Unlocking Digital Value for business and society in South Africa updated*, p5

¹¹³ The CSIR and DSI are currently working towards establishing the South African Blockchain Alliance (SANBA) which will support the utilisation of blockchain technologies locally.

¹¹⁴ Gauteng Department of Economic Development, 2020, *Gauteng Digital and ICT Market Quantification Report*, p152

- **Manufacturing** makes up 15% of the total value add to industry. The main technologies that are underpinning this contribution emanate from IoT and AI, which are particularly beneficial for modernising value chains and enabling efficient responses to demand.
- Digital transformation can also be expected to continue to create significant value in a **consumer industry, energy, communications and media**, adding between R58 billion and R382 billion to industry.
- **A substantial portion of the value added to industry is also attributed to the application of technology in the agriculture sector, accounting for 23% of the total value add to industry.** This is predicted to be a result of the adoption of sensory tech to monitor crops and growth in precision farming, which lends itself to increasing efficiencies and results in more, sustainable production. Approximately, 20% of the output in the agriculture sector is currently attributed to small-holder farmers.¹¹⁵ As rural and emerging farmers should gain increased access to technology and markets, we can expect that its potential value add to industry equates to approximately R90 billion, within the 10 year period, as a result of tech transformation.
- **Digital transformation also extends to the impact on government services.** For example, digital transformation in public healthcare had been estimated to add over R100 billion to industry within a 10 year period.¹¹⁶ Beyond this, value to society was projected to culminate to over R500 billion relating to consumer benefits, amongst other factors, such as cost savings, labour relating to job growth and income, society in relation to lives saved as well as government relating to welfare creation and cost savings.¹¹⁷ This is critical in the process to improve public health in South Africa, recognised in the National Digital Strategy for Health.¹¹⁸
- **The platform economy has the potential to improve efficiency and reduce costs significantly.** This has changed not only the ways businesses operate but how consumers do daily tasks. E-commerce platforms have increased the demand for goods and services, changed the way we shop and built in payment systems to ensure that transactions are easy facilitated. This has enabled businesses to scale rapidly. Business can grow their network of customers quickly; this is particularly important for informal businesses who typically are restricted to the resources and market participants in their immediate location.

Improved global competitiveness and exports – increased competitiveness means South African players can compete in the global arena, therefore tapping into much larger sources of demand than what is available in the local economy:

- Emerging conditions in the global economy may provide a unique window of opportunity for South Africa to grow its production of electronics. South Africa's global market share in the electronics market was 0.07% in 2018 after peaking in 2009 at 0.12%, and the trade deficit for electronics has been steadily growing since 2000.¹¹⁹ South Africa exports locally produced electronics to its direct neighbours, however, none of its target export markets in Africa have sufficiently large populations for the kind of volumes that production may require. To zero in on two critical trade brackets, namely cell phone and its components manufacturing, South Africa ranked 41st globally with 0.04% of global market share in 2019.¹²⁰ In electrical appliances and its components manufacturing, South Africa

¹¹⁵ Based on Stakeholder engagement with DSI (2020)

¹¹⁶ Accenture (2019), *Unlocking Digital Value for business and society in South Africa updated*, p4

¹¹⁷ Accenture (2019), *Unlocking Digital Value for business and society in South Africa updated*, p4

¹¹⁸ Department of Health, *National Digital Health Strategy for South Africa 2019-2024*, p12.

¹¹⁹ United Nations Statistical Division, Comtrade Data. 2019.

¹²⁰ This refers to code HS8517: Electrical Apparatus For Line Telephony Or Line Telegraphy, Including Such Apparatus For Carrier-current Or Digital Line Systems; Parts Thereof.

ranked 38th globally with a growing 0.16% of global market share in 2019.¹²¹ If South Africa were to grow its respective market shares in these two categories to 0.5% (similar to its global share of the automotive market at 0.54%) this would result in cumulatively USD 3 billion worth of electronics exports or an addition of nearly 10% to GDP.¹²²

- Over 64 800 agents and knowledge workers already provide globally or digitally traded services from South Africa to markets such as Australia, Canada, China, Europe, the United Kingdom, the United States and other African countries. This includes over 57 000 youth workers, approximately 6 600 inclusive hiring workers, people with disabilities, and a gender split of 65% females and 35% males. It is estimated that these jobs currently contribute about R16.1 billion export-driven revenue to South Africa's GDP. This contribution to economic growth is not limited to the size or scalability of the domestic economy as the sector is tapping into global sources of demand within the international GBS market.

The creation of new industries – an additional driver of growth in the digital economy is the creation and growth of relatively new industries, products and services that did not exist a decade ago:

- This is a key feature in the application of emerging tech domains where new types of products and services are developed. An example would be the previously non-existent offering of smart farm data collection and analysis services before.
- It also includes new features of existing industries that are creating new value-adding activities. For example, the e-commerce market in the country is growing significantly. In 2019, 52% of the South African population purchased at least one product online. This represents a growth rate of 14% and annual revenue of USD 3 billion.¹²³ Statista digital market outlook estimates that e-commerce will grow at an annual rate of 10%, earning a revenue of USD 3.9 billion in three years.¹²⁴

7.2. Job creation

The digital economy can create upwards of at least 1 million new jobs over the next 10 years. This will be a mix of formal jobs as we traditionally understand them, and new sources of income-generating work in the gig economy which is providing work for South Africans across a range of skills.

The adoption and development of transformative technology applications is creating key areas of employment opportunity. This is because adoption of technologies in these sectors is about enhancing functionality rather than replacing jobs. The adoption of emerging technologies will reshape how sectors like agriculture, healthcare 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. For example:

- In the agriculture sector, declining farm productivity is in part, attributed to a migration of youth away from agriculture and towards other opportunities in addition to high wastage¹²⁵ and low efficiencies.¹²⁶ Adoption of technologies will increase the sector's competitiveness and attract employment. This extends to smaller farmers which contribute substantially to food supply.¹²⁷ For example, GDARD has undertaken an initiative

¹²¹ This refers to code HS8543: Electrical Machines And Apparatus, Having Individual Functions, Others; Parts

¹²² Based on calculations by Genesis Analytics, 2020.

¹²³ E-commerce in South Africa, 2019, statista.com. Available at <https://e-commercedb.com/en/markets/za/all>

¹²⁴ Ibid

¹²⁵ For instance, approximately 27% of food production is wasted, on an annual basis.

¹²⁶ Accenture, *Unlocking digital value in South Africa's agriculture sector*, pp3-4.

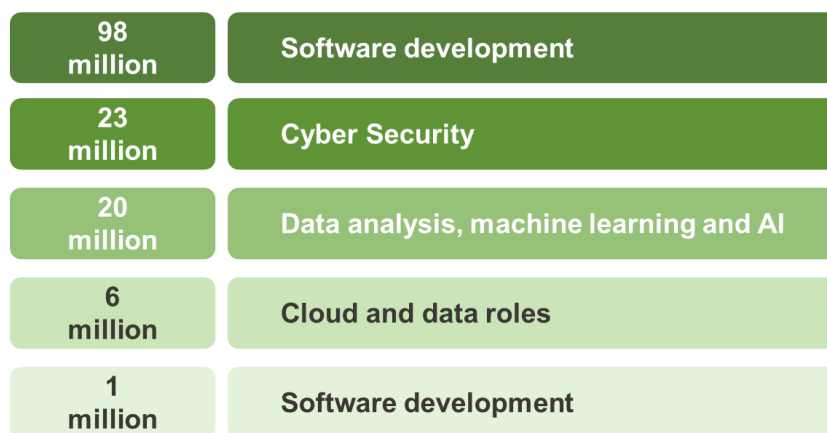
¹²⁷ KLK, 2020, *Why South Africa's agriculture industry needs digital transformation*, online, available: <https://www.klk.co.za/south-african-agricultural-industry-needs-digital-transformation-2/> [Last accessed: 06 April 2020]

to develop 150 SME agro-processing facilities located in townships.¹²⁸ Agriculture will therefore remain important for economic development and transformation through the provision of jobs and raw materials as well as its linkages to manufacturing and agriculture produce within the economy.

- In the health sector, the adoption of technologies has led to addressing capacity shortages, allowing staff to perform more human activities and functions. The current opportunities in Healthcare also lend themselves to job creation with the opportunity to scale. For example, Vula Mobile's model allows doctors to learn specialists' diagnostics on a case by case basis. This has resulted in the creation of a new specialist practice.
- 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.
- Moreover, such technology can be used to attract the global market for training and professional development reasons, such as the potential to leverage a growing interest in medical tourism.

Over the next five years, it has been estimated that global capacity for work relating to the adoption of tech across several domains of the economy amounts to 149 million jobs globally.¹²⁹ This includes roles in data analysis, machine learning, AI, software development and others, seen in the figure below. A further consideration is taking into account the value-add to industry in South Africa, from various industry sectors, resulting in the potential impact of over 500 000 direct jobs across these industry sectors, including over, 200 000 in financial services, approximately 90 000 in manufacturing and over 30 000 in Agriculture.¹³⁰

Figure 20: Global job capacity in the digital economy over the next 5 years



Source: Mariam Isa (2020), *Millions of jobs to be gained*, Finweek

Notes: Adapted based on Microsoft Data Science utilising LinkedIn Data

Digital platforms have been able to tap into a broad base of unskilled labour – this is particularly important for South Africa, which has an unemployment rate of 29.1%¹³¹. These platforms provide new employment opportunities at scale within the domestic economy. As result of increased job creation, income is generated, and more households are supported. Examining the 119 platforms operating in South Africa, we see that almost all of them have been able to provide employment through strengthening market linkages. Take for example, e-hailing services in South Africa which provides income to around 20 000 drivers, while cleaning services such

¹²⁸ Gauteng Department of Economic Development, 2020, *Gauteng Digital and ICT Market Quantification Report*, p153

¹²⁹ Mariam Isa (2020), *Millions of jobs to be gained*, finweek, online, available

¹³⁰ Based on Genesis Analytics workings, applying the employment intensity over the last 5 years, to the increased valued added to industry found in Accenture (2019), *Unlocking Digital Value for business and society in South Africa updated*, p4.

¹³¹ StatsSA. Unemployment rises slightly in third quarter of 2019.

as Sweep South have created 3 000 income opportunities for previously unemployed and underemployed domestic workers in a year alone. South Africa's largest retailer, Takealot.com employs over 2 000 people. The majority of which are drivers that are responsible for the courier function of the retailer. Industry stakeholders estimate that digital platforms will create 60 000 income generating opportunities in the next three years and 80 000 income-generating opportunities in the next ten years.¹³² Additionally, job matching platforms estimate that they will provide digital skills and work readiness training to 500 000 South Africans.¹³³

If the digitally traded services sector is able to by-pass and solve short-medium term scale constraints, it can create 100 000 net new jobs in five years. This number can scale significantly to 500 000 globally traded jobs over a ten-year period (2020-2030).¹³⁴ Achieving this growth will depend on reputational gains from the first five years of growth and driving greater innovation into new areas of global and digitally traded, personalised and social services. Moreover, it will rely on the successful reshoring of ICT work and contracts back to South Africa while the country consolidates and maintains its impact sourcing and inclusive hiring initiatives that include locating outsourcing centres directly in low-income communities and launching virtual outsourcing models and digital platforms.

7.3. Transformation

The digital economy can contribute to economic transformation in South Africa by re- and up-skilling at least 500 000 South Africans in the next five years and providing opportunity to at least 2.8 million SMMEs. This is based on three transformative impacts: opportunities to improve broad-based black economic empowerment, improving SMME opportunities, and connecting the township and rural economies to the formal economy.

Improving broad-based black economic empowerment:

- **The technology production sector has already shown some indicators for transformation which can be further enhanced.** For example, the IoT council membership is currently at 45% BEE for small companies, 21% for medium size companies and 34% for large companies. Overall, 37% are black owned, and 29% were minority black owned.
- **Transformative tech applications provide an opportunity to break incumbency in South Africa considering the long history of market concentration and large corporates that monopolise industries.** These tech-based innovative challengers tend to be more inclusive – they play better with other players in the value chain, are often themselves SMEs and have much lower barriers to entry, amongst many other factors. This is especially true if South Africa can encourage start-up development and entrepreneurship.
- **A number of digital platforms are recognising the importance of upskilling supply-side participants with training in a variety of forms.** In more mature markets like India, skills development has become a core business of digital platforms because of the higher rates of inter-platform competition. As such, upskilling supply-side participants to improve their technical and soft skills has become a commercial imperative to improve the customer experience and satisfaction among the platform's customers. Since most of these supply-side participants have limited face-to-face interaction with the platforms after being on-boarded, the platform's app becomes the primary channel of communication and delivering training content. Some of the platforms have 'gamified' training content to make it more appealing and relevant to supply-side participants.

¹³² Stakeholder consultations with industry stakeholders in the e-commerce and digital platforms sector.

¹³³ BPESA, Digital Empowerment Plan

¹³⁴ Genesis Analytics | 2019 South Africa in the Digital Age (SADA), *Pathways to Digital Work: A Strategy Primer for South Africa's Digital Economy*, p13

- **This Masterplan has proposed a digital economy transformation fund that pools financial resources from the private sector's enterprise development, supplier development and BBBEE equity equivalence programme spends.** With aggregated BBBEE spending, more impactful activities focused on empowering black-owned SMMEs operating in the digital economy and upskilling the millions of South Africans that need to be empowered to successfully participate in the digital economy.

Improving SMME opportunities:

- **Digital platforms have the power to enable market access both domestically and internationally.** Aggregators such as Jumia and Taobao have enabled small business to sell their products on online retail stores in Nigeria and China respectively. However, South Africa is lagging behind when it comes to using digital platforms to provide market access to small and medium enterprises. For example, Jumia enables small businesses that produce a range of goods from clothing, to electronics and homeware items to be sell their wares. This creates larger markets for small business whose target market is often restricted to their geographic location. Jumia not only acts as aggregator but also provides logistic support to courier goods between producers and consumers. Another example is Soko, an online jewellery store where jewellery is made in Kenya and sold in foreign markets such as in European countries or in the United States of America. Thus, extending market access beyond the domestic market and providing access to foreign markets enabling greater earning potential for producers.
- **Township and village enterprises in Tier II and Tier III cities and towns can also benefit greatly from digital trading platforms and IT-enabled SMME development programmes.** Digitisation can broaden access to supply chain, retail and platform distribution models. This includes the ability for township-based retail stores to link with urban retail chains, or mobile apps that connect township spaza shops with customers (see section on Digital Platforms). There are opportunities to enable more township enterprises through programmes such as the SMME Clearing House. This market-making platform provides opportunities within corporate value chains, opportunities to convert to franchises and a range of other enterprise and supplier development opportunities.¹³⁵

Connecting the township and rural economy with the formal economy:

- **Locally developed platforms are focused at solving for domestic problems that predominately occur in rural areas or townships where service delivery is limited.** Identified problems include issues of crimes being committed without any recourse, lack of early warning systems that are needed in densely populated areas and financial solutions – such as investing and savings products that are not met through conventional financial channels. As such some of the platforms that have been developed locally are solving for problems faced by low-income households. In order to generate buy-in and use of these services, developers have identified core needs that are currently not being met by existing businesses and are creating digital solutions. It is the hope that these are relevant to a larger portion of the population which therefore should enable their widespread usage. Solving for domestic challenges also allows for the development of technology that could have relevance in a foreign market, and these products could be exported.
- **Digitally traded services can also bridge the digital divide between urban and township economies.** Workers or freelance agents can tap into virtual, digital platforms and receive project-based work at home or from strategically located community hubs or micro centres. These gig economy platforms and virtual outsourcing models enable agents/employees/freelancers to receive work (gigs) remotely from their homes or to work-from-anywhere. As such, these digitally traded services can

¹³⁵ Gauteng Department of Economic Growth and Genesis GBS/Knowledge Executive | 2019 | Gauteng Digital and ICT Market Quantification Report, p172

stimulate job creation and economic growth across South Africa by bringing jobs to people wherever they are based.

APPENDIX: ACTIONS IN THE PRIORITY ACTION PLAN

MONITOR

Enabler	Action Required	Coordinator/s	Co-Implementing Partners	Time
Digital inclusion	Expedite spectrum auctioning and expand allocation beyond large MNOs	DCDT/ICASA	Industry	1 year
	Reduce the administrative burden of obtaining wayleaves	DCDT	COGTA, Municipalities	2 years
	Improve the national backbone (backhaul) infrastructure to cover remote areas (including SA Connect)	DCDT	BBI, Sentech	3 years
	Development of space and satellite infrastructure	DSI/SANSA	DCDT & Sentech	3-5 years
Skills for Work	Coordinate implementation of the Digital & Future Skills Strategy	DCDT	DHET, DBE, SETAs, NEMISA, & Industry bodies	1 year
	Establish an industry-wide mechanism for re- and up-skilling for the future skills required in the digital economy.	DCDT	DTIC, DHET, National Skills Authority, NEMISA, SETAs, Universities & Industry bodies	1 year
	Building a 4IR Digital Army – Free Training on key digital skills such as data science, coding, Apps development, AI and Digital Marketing (<i>Target of 50,000 unemployed South Africans</i>)	DCDT	DHET, NEMISA & Coursera	1 year
	Implement large scale integrated workplace learning solutions	DCDT	Digital Hubs, DSI, DHET & Demand-led industry bodies.	3 years
	Implementation of the Seeds for the Future Programme	DCDT	Huawei	3 years
	Implementing the Huawei ICT Academy Programme – certify universities, colleges & TVETs as Huawei ICT Academies	DCDT	DHET, Huawei , Universities & TVET Colleges	3 years
	Huawei 4IR Talent Training – Fundamental Training on 5G & Cloud Technologies for University & TVET students	DCDT	DHET, Huawei , Universities & TVET Colleges	3 years
	Digital Skills - Train 188 unemployed black youth in software development	DCDT	DTIC, Samsung , ICT BBBEE	3 years
	Engineering skills - Train 100 unemployed black youth in Electronics, air-conditioning and refrigeration	DCDT	Samsung, DTIC, ICT BBBEE	3 years

Skills for Work	Re/ Start: AWS Cloud Training aimed at entry level professional qualification and re-skilling and workforce placement	DCDT	AWS, DTIC, ICT BBBEE & DHET	Ongoing enrolments
	AWS Educate: Introduction to Cloud Computing for senior school students	DCDT	AWS, DTIC, ICT BBBEE & DHET	Ongoing enrolments
	AWS Academy – Tertiary level AWS Accredited Cloud Computing Training Course	DCDT	AWS, DTIC, ICT BBBEE & DHET	Ongoing enrolments
Responsive governance	Implementation of a policy that addresses data access and sharing that supplements the current Protection of Personal Information (“POPI”) Act	DCDT	DTIC, DSI, State Security & DPSA	2 years
	Development of a competition regime that caters to digital businesses and markets, Competition Commission.	DCDT	DTIC, Competition Commission & ICASA	1 year
	Amendment of the Electronic Communications Act to implement recommendations of the data services market enquiry (DCDT lead, DTIC, CC, ICASA & COGTA)	DCDT	DTIC, Competition Commission, ICASA & COGTA	1 year
Innovation & competitiveness	Implementation of the Technology Innovation & Commercialisation Strategy.	DTIC	DCDT, DSI, SOCs & other Departments	3 years
	Map the innovation funding process for digital innovations from R&D to final launch.	DSI	DTIC, DCDT, SEDA & TIA	1 year
	Reform South Africa’s IP policies and patent grant system.	DTIC/DSI	CIPC, NIPMO & DCDT	3 years
	Mobilise digital, ITO and ICT companies to participate in export market opportunities	DCDT/DTIC	DSI, BPESA, InvestSA, the, and the PPGI ICT working group	3 years
	Implement a programme to support Black industrialisation through e-Waste recycling.	DCDT	DTIC, Samsung , ICT BBBEE, Department of Environmental Affairs	3 year
	Entrepreneurship & township economic development - Support & Development of 2 Accredited Services Centres	DCDT	DTIC, Samsung , ICT BBBEE, Department of Environmental Affairs	3 year
Government digitization	Create digital bureaus that enable youth and SMMEs to clean and analyse government data	DCDT	Department of Public Works & Infrastructure, National Treasury PPGI ICT Working Group and	2 years
	Digitise manual records across key government departments.	DCDT	Department of Public Work & Infrastructure, National Treasury PPGI ICT Working Group and	2 years

Monitor

Big bets	Actions Required	Coordinator/s	Co-Implementing Partners	Time
Physical Technology production	Manufacturing of smart mobile devices	DTIC/Mara Phones South Africa	DCDT, SEZ	
	Mobile phone assembly plant in South Africa (Low cost phones)	DTIC/Mobicell	DCDT	
Transformative Tech applications	Establishment of the Government-Drone Industry Forum	DCDT	Drone Council of South Africa, DoT, ICASA.	1 year
	Incubate the Drone Council of South Africa in order to support the development and growth of the drones industry in South Africa	DCDT	Drone Council of SA, DTIC	3 years
	Development of the Drones Country Strategy	DCDT	Drone Council of South Africa, DoT, DTIC, DSI, ICASA & others	1 year
	Connect the players in the blockchain ecosystem in South Africa.	DSI	South African Blockchain Alliance DCDT, DTIC, CSIR	3 years
	Facilitate collaboration between government, academia, research organisations, business, start-ups and civil society			
Digital Platforms	Investment of R100 million in agritech business Aerobotics (2020)	DCDT	Naspers Foundry	3 year
	Strengthen technology Commercialisation and harness the entrepreneurship of the technology community in South Africa	DSBD/SEDA	DCDT, DSI, DTIC	3 years
	Demystify the regulatory landscape, provide a space for safe experimentation and actively advance innovation in fintech.	SARB/Fintech Working Group (IFWG)	NT, Financial Intelligence Centre, the Financial Sector Conduct Authority, National Credit Regulator, SARS & DCDT	5 years
	Investment in The Student Hub, an online platform that helps TVET colleges overcome physical infrastructure constraints (R45 million, 2020)	DCDT	Naspers (Naspers Foundry)	3 years
	AWS Equity Equivalent Investment Program (EEIP) - Enrolment and certification of black South African ICT entrepreneur cohort as members of global Amazon Partner Network (APN) in 18-24 month program.	DTIC/DCDT	Amazon Web Services (AWS), ICT BBBEE	5 years

Implement

Enabler	Action Required	Coordinator/s	Co-Implementing Partners	Time
Digital inclusion	Providing clear direction on the Wireless Open Access Network (WOAN)	DCDT	ICASA	1 year
	Establish the Digital Development Challenge Fund (DDCF) and define the scope of the DDCF to include applications for developing digital ecosystems	DCDT	National Treasury, DPSA and USASA	1 year
	Provide funding to private sector to make last-mile connection to homes and communities	DCDT	DBSA	5 years
	Google digital infrastructure investment funding in Cape Town/Western Cape: fibre optics submarine cable (R2,2 billion, Investment Summit)	DCDT	Google SA	
	Investment of R8 billion to expand infrastructure across the country (Investment Summit)	DCDT	Telkom	
	Commitment of R4.4 billion investment in Data infrastructure (Investment Summit)	DCDT	Teraco Data Environments	
	Pledge of R875 million to expand their respective data centre infrastructure in Gauteng (Investment Summit)	DCDT	NTT and Dimension Data	
Skills for Work	Set aside discretionary SETA funding that is not subject to accreditation approval for micro-credentials.	DHET	DCDT, SETAs, SAQA, National Skills Authority and industry associations	2 years
	Ensure all SETAs incorporate digital skills planning in the sector skills plans taking note of the specific applications of digital technologies and processes.	DHET	DCDT, SETAs and industry associations	2 years
	Microsoft AI University - Implement the AI University Programme across Universities and TVET colleges in South Africa for availability in 2021. Directly train 48 lecturers and indirectly training over 1000 students to become AI engineers,	DCDT	Microsoft, Universities & TVET Colleges	6 months
	Microsoft Global Skilling Initiative - Microsoft launched the global skills initiative as a response to the economic crisis.	DCDT	Microsoft	12 months

	Microsoft Skilling of Jobseekers - Upskilling of jobseekers through Microsoft Global Skilling Initiative, Including 10 learning pathways of digital jobs most in demand, critical soft skills and collaboration and basic digital skills.	DCDT	Microsoft & Afrika Tikkun	6 months
Responsive governance	Regulators identify the key regulatory blockages to the scaling of digital businesses and formulate an action plan for addressing this.	DCDT	DTIC & Department of Transport	1 year
Innovation & competitiveness	Scale-up the dtic's GBS incentive scheme to attract a broader set of international investors and create more digital and ICT jobs.	DTIC	DCDT and PPGI ICT Working Group	1 year
Government digitization	Expedite the implementation of e-government services.	DCDT	SITA	2 years

Fund

Enabler	Action Required	Coordinator/s	Co-Implementing Partners	Time
Digital inclusion	Create incentives and an enabling environment for the establishment and expansion of data centres based in South Africa	DCDT		3 years
Skills for Work	Establish digital apprenticeship centres that absorb digitally skilled candidates	DCDT	SiMODiSA Association and digital incubators, DSBD, SEDA	5 years
Responsive governance	Develop a methodology for measuring the size and nature of the digital economy.	DCDT	StatsSA	1 year
Innovation & competitiveness	Create public-private deal making teams that match-make and facilitate investment and partnerships with global buyers of tradeable services	DCDT	dtic, InvestSA, BPESA and the Department of Home Affairs	1 year
Government digitization	Consolidate existing contact centres through the President's hotline and scale up government frontline citizen care and support services	DCDT	Presidency, PPGI ICT Working Group, BPESA	3 years

Plan

Enabler	Action Required	Coordinator/s	Co-Implementing Partners	Time
Digital inclusion	Establish device refurbishing centres for second-hand devices and upgrade shared public facilities to provide smart devices and broadband connectivity	DCDT	Co-implementing partner to be identified	5 years
Skills for Work	Modernise South Africa's qualifications and credentialing system to take into account new ways of learning which include micro-credentials	DHET	DCDT, SAQA, National Skills, SETAs	3 years
	Cloud Diploma: 2-year diploma course offered with participating universities - Development of high-level AWS Cloud Skills trained cohort	DHET/DCDT	AWS, MICT Seta, SAQA & Universities - Introduction -Pending accreditation	
	Cloud Degree 4-year degree course offered with participating universities - Development of high-level AWS Cloud Skills trained cohort	DHET/DCDT	AWS, MICT Seta, SAQA & Universities - Introduction -Pending accreditation	
Responsive governance	Establish and execute national strategies for the development and application of digital technologies in priority domains including develop innovation facilitation tools such as regulatory sandboxes and innovation hubs	DCDT	DSI, DTIC & CSIR	5 years
Innovation & competitiveness	Scale and promote work-from-anywhere digital platforms that facilitate outcomes-based work for South Africans in townships and rural villages	DCDT	Co-implementing partners to be identified	5 years
Government digitization	Develop a central ICT government procurement system to manage technical scoping of required digital and ICT support within government	National Treasury	DTIC, DSBD, DTIC co-implementing partners & The State-Owned Enterprises Procurement Forum	3 years

