



**telecommunications
& postal services**

Department:
Telecommunications and Postal Services
REPUBLIC OF SOUTH AFRICA

CONCEPT DOCUMENT

ESTABLISHMENT OF THE PRESIDENTIAL COMMISSION ON THE FOURTH INDUSTRIAL REVOLUTION

1. Introduction and Problem Statement

“Our prosperity as a nation depends on our ability to take full advantage of rapid technological change. This means that we urgently need to develop our capabilities in the areas of science, technology and innovation. We will soon establish a Digital Industrial Revolution Commission, which will include the private sector and civil society to ensure that our country is in a position to seize the opportunities and manage the challenges of rapid advances in information and communication technology. The drive towards the digital industrial revolution will be underpinned by the availability of efficient networks.” – President Cyril Ramaphosa, State of the Nation Address, 2018.

- 1.1. It is now globally recognized that the Fourth Industrial Revolution (4IR) represents a fundamental change in the way we live, work and relate to each other. It is inevitable that, as with any revolution, it will effect change in desirable and undesirable ways.
- 1.2. The effects of the change of this revolution are already evident in the way in which societies produce, distribute, and consume the full range of goods and services that underpin human existence and which drive human development. However, there are considerable differences in the pace of change within different socio-technical systems and between different countries. A particular area of intense change is in production systems leading many to frame and manage the transition brought upon by this revolution.
- 1.3. At the centre of the 4IR will be future communication systems and networks that will apply technologies such as artificial intelligence and distributed ledgers to decentralize and automate network management, data analytics and shared knowledge.
- 1.4. Most countries are grappling with efforts to make sense of the changes and to formulate effective responses that minimize the threats and maximize the opportunities. In South Africa, we require an inclusive process to guide our response with the full understanding of the triple challenge of poverty, inequality, and unemployment that underpin the National Development Plan (NDP). The NDP should therefore be seen as the basis or foundation of South Africa’s approach to the 4IR - meaning that our policies, strategies and plans should seek to advance the goals of an inclusive and shared growth. A core short-term focus of South Africa’s national response will be on the impact of the changing technological landscape on the economy and employment.
- 1.5. In the medium to long-term, a more broad-based approach will be required that looks at the threats and opportunities that technological change and convergence will have on South Africa’s other development imperatives including; economic infrastructure, environmental sustainability and transitioning to a low-carbon economy, an integrated and inclusive rural economy, human settlements, education, training and innovation,

health, social protection, safer communities, and building a capable and developmental state.

- 1.6.** The National e-Strategy¹ focus on the transformative power of the digital technologies in many industries and sectors of the economy and hence these e-strategies lay a strong foundation for a programme in the 4IR. The strategy advocate for a collaborative approach to the 4IR programme both locally and in collaborating with international organizations. While it is clear that the initial focus would be on encouraging innovation in the digital technologies, the proposed Presidential Commission on the Fourth Industrial Revolution must not ignore importance of biological technologies and the transformative power of the fusion of these disciplines.
- 1.7.** Achieving inclusive growth should also be at the center of our approach. There should be a symbiotic relationship between the boosting of competitiveness and achieving inclusive growth. South Africa has to use the 4IR to enhance its competitiveness. As one of its outcomes of the planning process to be led by the Commission on the 4IR should detail interventions to be carried out in achieving competitiveness of the key economic sectors and these include; agriculture, finance, mining, manufacturing, ICT and electronics, and business with science, technology and innovation as a cross-cutting support function. Likewise, South Africa's plans to achieve growth should deal with efforts to promote inclusive growth by amongst others paying specific attention to rural development and the participation of youth and women throughout the value chain of the 4IR.
- 1.8.** The rapid rise and convergence of emerging technologies as well as physical and biological worlds is driving the 4IR. The 4IR is a collective term for technologies and concepts of value chain organization which draw together cyber-physical systems, the Internet of Things (IoT) and the Internet of Services (IoS), together with other emerging technologies, such as cloud technology, big data, predictive analytics, artificial intelligence, augmented reality, agile and collaborative robots and additive manufacturing. The promise of fast, flexible, high-quality and efficient production will reach new dimensions as 4IR concepts and technologies are introduced.

¹ Digital Society South Africa of 2017

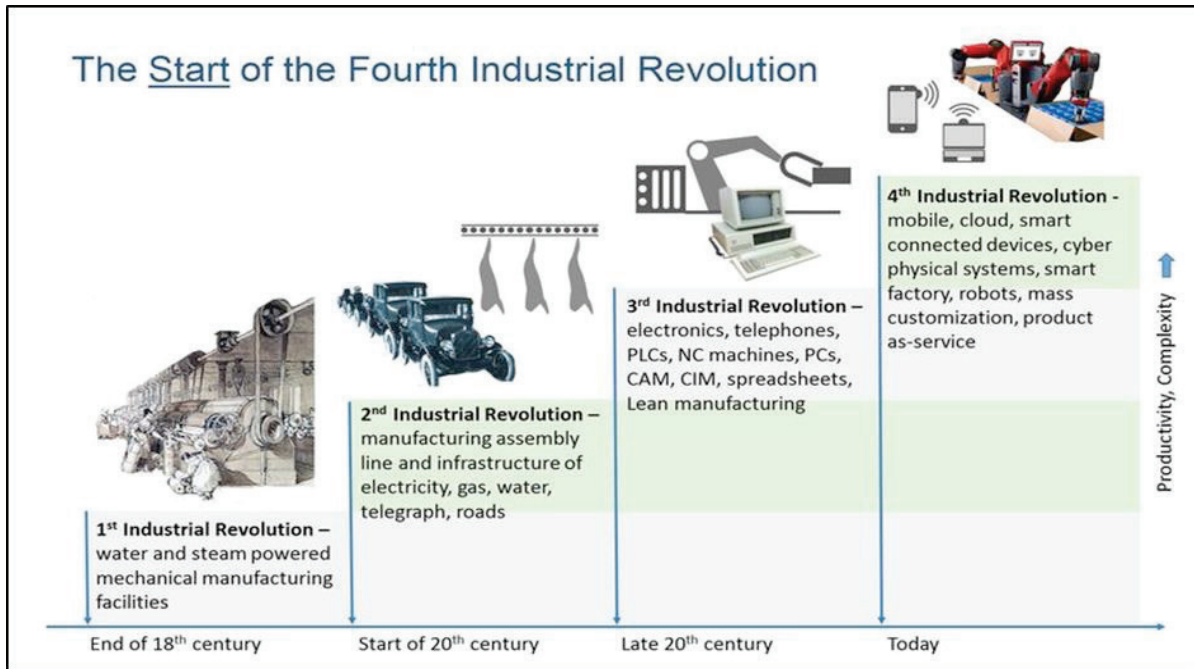


Figure1: Four Phases of Industrialization

- 1.9.** The physical and biological worlds are merging partly thanks to the creation of new materials designed to emulate the biological world. The biological and digital worlds overlap with the world of genetic engineering and in the form of sensors used to monitor personal health and behavior, and to understand and influence brain activity.
- 1.10.** Advances that might have once been confined to digital systems, like the application of cryptography to block-chain technology in order to create programmable, secure and distributed records, are now having widespread impact in the real world. Blockchain, best known as the basis for Bitcoin virtual currency, could for example provide ways to manage land records, transfer shareholdings and track deforestation.

2. Global Environmental Landscape

- 2.1** Globally, several reports to date indicate that the main benefits of the 4IR have been felt by consumers on the demand side of the economy who already enjoy access to technology. The list of products and services that can be accessed remotely today is almost endless, from gaming to payment methods, entertainment and more. However, the next phase will predominantly be focused on the supply side of the economy with massive structural improvements in efficiency and productivity, driving economic growth and leading to a rapid price deflation in the cost of global trade.

2.2 The effect on business will also be profound. Companies around the world will be forced to re-examine the way they do business. There is now a need from business leaders to understand the changing environment, to re-examine the status quo from an operational perspective, and to relentlessly innovate in order to stay relevant.

2.3 The World Economic Forum (WEF) has developed a data-driven tool to assess country readiness or ability to capitalize on future production opportunities, mitigate risks and challenges and be resilient and agile in responding to unknown future shocks. In the current scenario, this translates to a country's readiness to adopt 4IR paradigms. The tool assesses the maturity and stability of a country's production system (including complexity and scale of their manufacturing base) and various drivers of production (including, but not limited to, innovation potential, resources, human capital and global trade and investment environment) in broad terms. Based on these assessment countries are designated as either:

- High Potential – Limited current production base, but positioned well for the future;
- Leading – Strong current base and positioned well for the future;
- Legacy - Strong production base, but at risk for the future; or
- Nascent – Limited production base and at risk for the future.

2.4 The Readiness for the Future of Production Report 2018 by WEF shows the 2018 results of the global assessment of production readiness. From the report, 25 of the 100 countries assessed are considered as "Leading" and that these countries already account for 75% of global manufacturing value add. While these countries are the early leaders in adopting 4IR paradigms or implementing institutional structures and frameworks to adopt technologies and practices, in reality no country is 100% ready at this early stage. However, lessons can be learnt from early leaders (China, Germany, Japan, Republic of Korea, Singapore and the United States of America) and adapted to the South African context. Conversely, 90% of the countries assessed from Latin America, Middle East, Africa (including South Africa) and Eurasia are considered "Nascent". However, new technological paradigms serve as an opportunity for "Nascent" countries as they have the potential to leapfrog established industries as they are not necessarily tied into legacy production systems.

2.5 As a country, in order to improve our competitiveness, we are also engaged at several multilateral level. These includes: The African Telecommunications Union, the BRICS Working Group on the 4IR, G20 initiatives and WEF/ITU African Centre for Digital Transformation.

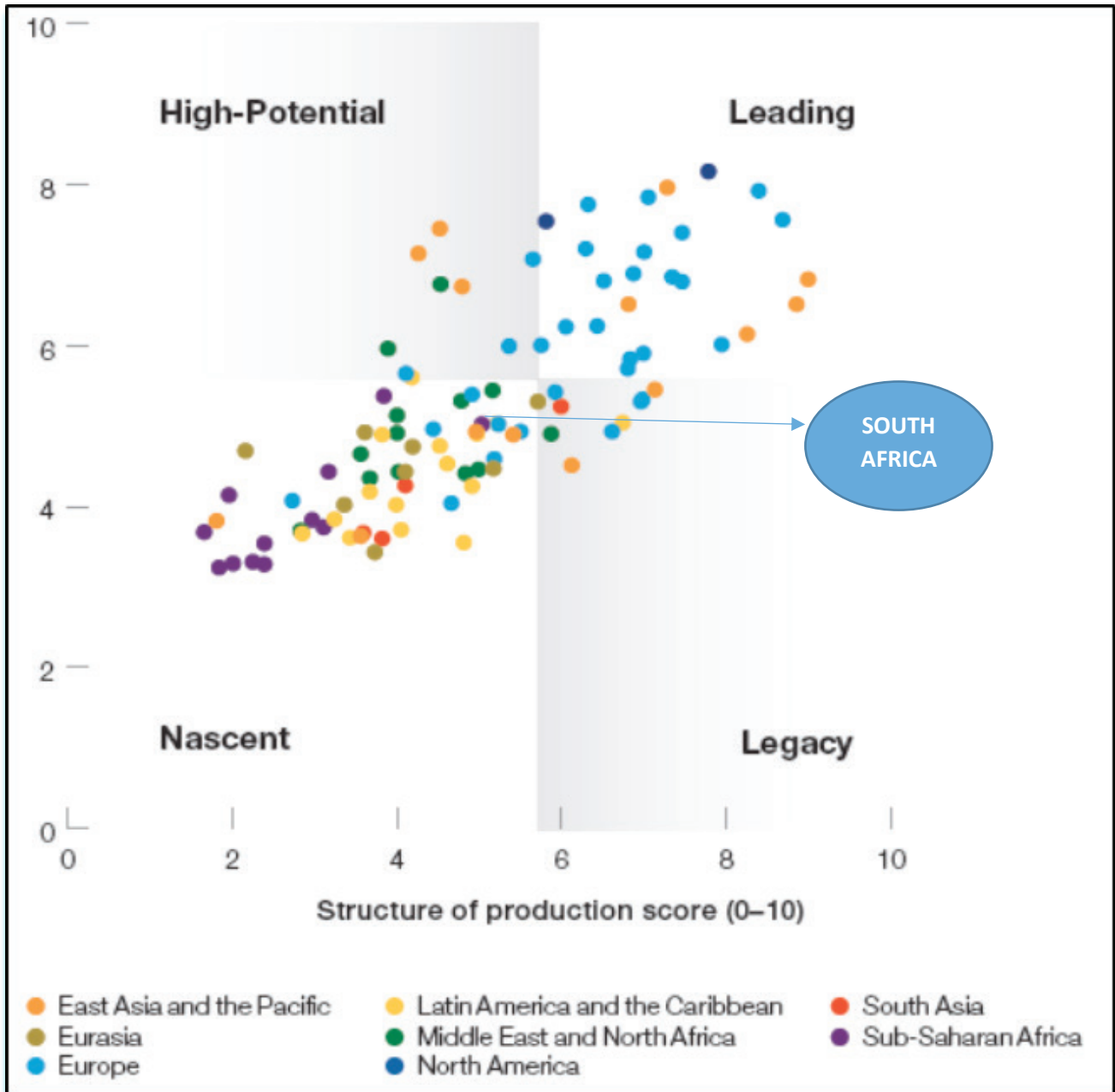


Figure 2: Global assessment of production readiness – South Africa (WEF, 2018)

2.6 As indicated in Figure 2 above, South Africa is ranked number one in Africa on the structure of production, and number 2 on the drivers of production. Though we are in the Nascent, we are still close to leap frog to the leading group and these are some of the comparative advantages:

- South Africa's manufacturing share of the GDP has decreased to 12% since early 1990s.
- South Africa has strongest structure of production in Africa.

- South Africa has ability to innovate with a strong innovation culture and entrepreneurial activities are supported by sophisticated financial sector.
- Human capital remains the most pressing challenge, with shortage of engineers, scientists and digital skills.
- Stable policy environment but need to improve its institutional frameworks to respond to change.

2.7 However, we have a problem with skills and the Commission will come up with interventions to address human capital development.

3. Implications of the Fourth Industrial Revolution

It is anticipated that the 4IR will have an impact on government, business and society as follows:

3.1. Impact on Government

Government has the responsibility to deliver digitally-enabled services to the citizens. It is also a model user of information and communication technologies (ICTs). In addition when digitizing content, government will be a major source of digital content which is required for the digital economy. In this regard, there is an urgent need for development of a national data policy.

In light of the advances brought upon by the 4IR, governments will increasingly face pressure to change their current approach to public engagement and policymaking. Legislators and regulators must continuously adapt to a new, fast-changing environment, reinventing themselves so they can truly understand what it is they are regulating. Governments and regulatory agencies will need to collaborate closely with business and civil society as they will not be able to address emergence of digital economy in isolation, however it must build and develop capacity to drive the process robustly. New technologies and platforms will increasingly enable citizens to engage with governments, voice their opinions, coordinate their efforts, and even circumvent the supervision of public authorities.

Smart cities are another platform to expedite the diffusion of technologies at municipal level. The concept of smart cities has evolved over time to include 4IR thereby enabling cities to make more efficient use of resources in their operations. Providing housing to the financially disadvantaged has been one of the burning issues for most governments of developing countries. With the help of additive manufacturing technology, low cost

houses can now be built within twenty-four hours. The materials used for building these houses are typically environmentally friendly and cost around fifty thousand rands in total. Waste management in the era of 4th Industrial Revolution has also progressed as segregation of waste generated by cities is much easier and faster than before. Robots can now be used to segregate waste into different categories like recyclable waste, bottles, papers, plastics etc. in a completely autonomous way. The segregated waste can then be recycled or used for other purposes like generation of electricity. Big data analytics affords cities the possibility of managing traffic, scheduling transportation services, and responding to emergencies in a more efficient way.

3.2. Impact on Business

The revolution is disrupting all sectors of the South African economy, from primary, secondary to the tertiary sectors. The ubiquity of communication technologies, especially mobile and cloud computing and access to massive amounts of data has shifted the relationship between businesses and their customers to an on-demand, always connected model. A business ecosystem that enables various parties to expose their capabilities and leverage the capabilities of others to create new services, products and customer experiences are driving higher levels of business value. The world is struggling with disruptions to transport industry, tourism and telecommunications sectors by new services such as Uber, Airbnb and whats-app among others.

In most of these cases, while customers are benefiting from ease of access to more affordable services, the regulators have not been prepared for these and have not been able to level the playing and have left the incumbents in disadvantaged positions. Policy makers and regulators must there be pro-active in dealing with introduction of new technologies. Some of the industries (but not limited to) which the 4th Industrial Revolution has already affected are the banking and financial sectors, cities, manufacturing, trade, transportation etc.

3.3. Implications for trade and industrial policy

Much of the 4IR involves unprecedented growth in digital information underpinning the production, marketing, trade, distribution and consumption of goods and services. This digitalization process impacts multiple spheres of economic and social relations and require associated research and policy responses. There is thus a specific and urgent need to set out a coherent policy framework to respond to the impact of digitalization on South Africa's trade relations within global trading system and its impact on a range of sectors of the economy including in manufacturing, retail and information and communication technology. The work of the Commission is to guide on the approach

towards the development of a national data policy, how through e-Commerce platforms we can position South Africa for global competitiveness and how government can address issues of taxation of electronic platforms.

3.3.1. Manufacturing Sector

The South African manufacturing industry has the adoption level of smart technologies that accelerate the 4IR remaining at the foundation stage, with some sector differences. There is an appreciation for advanced analytics within the automation and automotive sectors, but manufacturers generally not yet explore the real opportunities for advanced analytics. The adoption of Cloud solutions is currently more driven by consumers than businesses, with cyber-crime fears and privacy issues cited as main concerns by the latter. Advanced sensor technologies are, with some exceptions (e.g. automotive industry), still at a foundation stage. However, there is a lot of interest among manufacturers to better leverage the potential for monitoring, controlling, tracking, etc. Usage of robotics is mostly at an automated stage and not yet at a smart or advanced stage. There is no widespread adoption of additive manufacturing yet within the South African manufacturing industry, although awareness of the significance and the potential of this exponential technology is high (Deloitte, 2016).

3.3.2. Banking Sector

The 4IR is changing the way the banking sector does business. Now, a customer's physical proximity to the branch of a bank is no longer of concern. The customer can now interact with the banks through websites and mobile apps and visit the branch only once or twice a year. In general, the customers' expectation is to have a more personalized experience with a high level of security while banking using these digital platforms. The expected experience and security can be provided using modern technology. Artificial Intelligence can play a big role in this regard. It can assist customers to manage their funds depending on their spending and earning patterns, thus providing a personalized touch. New technologies like wearable banking – i.e. banking using wearable devices like smart watches is gaining popularity in other parts of the world. Robotics is already being used in the banking sector to efficiently handle basic customer queries and assist in clearing of cheques and carrying out simple transactions. New technologies such as block chain and its applications like crypto currencies, smart contracts will change the banking sector in the next few years thus making processes faster and more efficient.

4. Key enablers for the Fourth Industrial Revolution

4.1. Investment in critical, enabling ICT infrastructure to develop a Digital Economy

The Department of Telecommunications and Postal Services (DTPS) has put in place some building blocks to enable South Africa to take up opportunities brought upon by 4IR. This includes approval of the National Integrated ICT Policy White Paper in 2016. The White Paper underscores the need to urgently address the drivers of an ICT enabled growth and development trajectory including the rollout of high speed and affordable broadband services, development of e-literate society through a skills development plan targeting all areas of society, ensuring affordability of the Internet and related services, improving the quality and security of the ICT networks, participation and pioneering role of small, medium and micro-sized enterprises (SMMEs) in the development of new technologies etc. The DTPS further received Cabinet approval for the ICT SMME Development strategy, National e-Strategy and e-Government strategy in 2017, respectively.

More guidance is required from the Commission in areas of data policy, digital skills development and further interventions for reducing cost to communicate.

4.2. Innovation, Research and Development

A strong innovation system has been shown as key to a country's ability to adapt to rapid technological change. With the pace and scope of change of this industrial revolution, it will be crucial that the country's innovation system be strengthened. This would be in basic and applied research domains identified as the key drivers of 4IR, as well as the convergence and subsequent application of new technologies. This should be complimented, as has been seen in many more advanced countries (Australia, Germany, United Kingdom) with suitable demonstration facilities (or Learning Factories) that allow for learning and real-world experimentation to facilitate the integration and adoption of convergent technologies.

Supporting the Research, Development and Innovation (RD&I) activities should be a strong enabling environment. This would include sufficient funding for RD&I, as well as the adoption and implementation of new innovation (suitable grant, venture and investment funding instruments). Funding instruments should ideally be targeted at technology development or technology adoption and equally tailored and focused towards adoption by established industries versus new entrant and SMMEs.

The establishment of the African Digital Transformation Centre is critical as a coordination mechanism to support entry and growth of SMMEs in various aspects of these future

communication systems and networks as well as digital transformation of other key sectors of the economy in the 4IR.

Finally, this innovation environment should be supported by conducive policy and government incentives for both development and adoption of new technologies and manufacturing paradigms, but also for greater collaboration between companies.

There is therefore a need for a National Innovation Strategy that will guide how South Africa can use research, development and innovation to take advantage of the 4IR.

4.3. Skills development

As entire industries adjust, most occupations are undergoing a fundamental transformation. While some jobs are threatened by redundancy and others grow rapidly, existing jobs are also going through a change in the skill sets required to do them. According to the WEF, the impact is likely to be highly specific to the industry, region and occupation in question, as well as the ability of various stakeholders to manage change (WEF, 2016).

The World Bank recently released its South Africa Economic update and suggests that greater R&D efforts are likely to create more jobs rather than shed jobs in net terms. The resilience of the South African high-tech manufacturing sector, at a time when lower-tech manufacturing sectors are shedding jobs, is seen as supportive of this view (World Bank, 2017)² However, the nature of the labour required is likely to be more skill intensive, which could exacerbate the structural unemployment due to skills mismatch prevalent in South Africa. What technology policy choices can be made to increase absorption of unskilled or low skilled labour in the interim?

The work of the Commission need to provide guidance on how government can address the issues relating to massification of skills at society level, curriculum innovation at school level, digital literacy, re-skilling the youth and the development of innovation capabilities.

4.4. SMME, Entrepreneurship and Localization

It should be recognized at this early stage of policy development that the implementation of 4IR paradigms has the potential to greatly enhance the manufacturing competitiveness of the country, but equally has the potential to further widen the gap between the formal and secondary economies. If focus is placed purely on the established manufacturing

² World Bank, South Africa Economic Update: Innovation for Productivity and Inclusiveness (2017)

sector, then key opportunities will be missed in the informal sector. One of the key paradigms of the 4IR is that traditional manufacturing systems will be disrupted in the view of decentralized, distributed and personalized manufacturing. This paradigm offers a unique opportunity within the South African context as we already have a strong secondary economy. This also extends beyond typical manufacturing into convergent and disruptive technologies in the service, tourism and artistic sectors. Already disruptive technologies like Uber are creating multiple micro-industries supporting livelihoods. Similar disruptive technologies within the secondary economy should be explored actively.

While big companies do contribute to enabling infrastructure, SMMEs can lead the digital transformation effort and innovation. Already there are a myriad of SMMEs that have emerged across the different sectors of the economy with interesting 4IR innovations even if many struggle to enter the market due to unabating entry barriers in most if not all the sectors of the economy. Again the outcome of the planning effort should prioritize both financial and non-financial measures to promote the participation of SMMEs throughout the value chain. Funding for SMMEs in the 4IR should also be prioritized.

And while attracting Foreign Direct Investment (FDI) remains an important policy consideration, participants at the recently held Job Summit placed more emphasis on local solutions in the form of localization of the design, development and production of local technologies both for local use and export purposes. Key state institutions especially the universities and the research institutions should be mobilized to support this vision.

More guidance is required from the Commission on a national strategy to enable growth for SMMEs addressing the culture of entrepreneurship, funding and access to market.

4.5. Labor market restructuring

The 4IR will clearly transform the way we live and work. As more individual tasks become automatable through artificial intelligence and sophisticated algorithms, jobs are being redefined and re-categorized. Some jobs will disappear, others will grow and jobs that don't even exist today will become commonplace. By one popular estimate, 65% of children entering primary school today will ultimately end up working in completely new jobs that don't exist yet (WEF, 2016).

It is anticipated that a wide range of occupations will require a higher degree of cognitive abilities, such as creativity, logical reasoning and problem solving, as part of their core skills. More than half of all jobs expected to require these cognitive abilities as part of their core skills currently do not (WEF, 2016). Apart from these generic skills and

capabilities, specific technical skills will be required for a company to be successful in the 4IR, as it is driven by a combination of new and emerging technologies. Thus, Roland Berger provides four categories of skills for the 4IR, highlighting the importance of specialized ICT skills, working with data and knowledge of technology (generic and manufacturing process specific) in addition to personal skills.

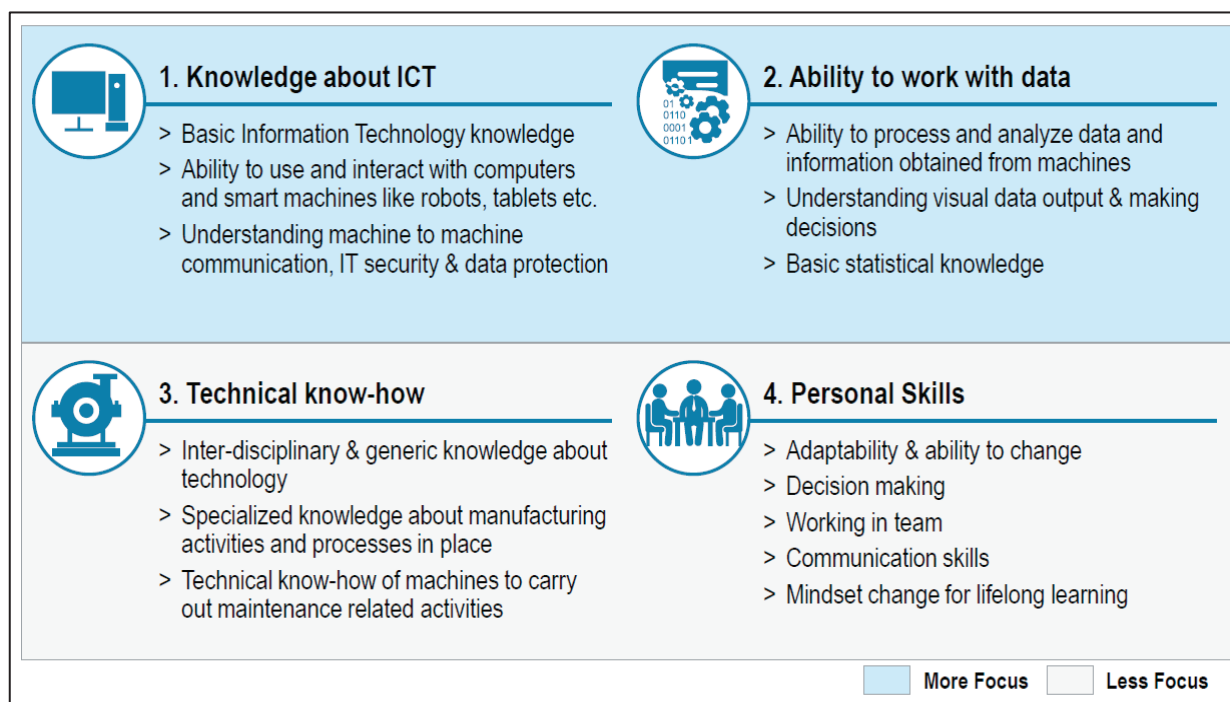


Figure 2: Categories of skills required for 4IR (Roland Berger, in BRICS 2016)

Therefore, some jobs will be lost through the introduction of robotics on the shop floor and the computerization of routine jobs. Routine cognitive work, including jobs in production planning, will also be affected (BCG, Sep 2015)³.

In the South African context with how high the unemployment rate is, the Commission should find ways to address the challenge. The 4IR will also fundamentally change how some jobs are performed, including those of the assembly line worker, mobile service technician and machine operator.

4.6. Enabling confidence on the adoption

The Commission must assist government to develop measures to build confidence in our systems and infrastructures in the adoption of the fourth industrial revolution.

³ BCG, Industry 4.0: The Future of Productivity and Growth in Manufacturing Industries (April 2015)