NEDLAC
Futures of work in South Africa

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INSTITUTE FOR FUTURES RESEARCH

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INTRODUCTION

As has been the case for all previous industrial revolutions, the Fourth Industrial Revolution (4IR) will, of necessity, result in technological, economic, social, political, business, moral, and even aesthetic disruption. The perceived impact of this disruption ranges from the dystopian to the enlightening. Commenting on the First Industrial Revolution, Henry David Thoreau, lamented the fact that "Men have become the tools of their tools." In a similar Dickensian tone John Boyd Orr states that "When the Industrial Revolution of the nineteenth century brought a rapid increase in wealth, the demand of workers for a share of the wealth they were creating was conceded only after riots and strikes." Two and a half centuries later, Stowe Boyd claims that the central question of 2025 will be: "What are people for in a world that does not need their labour, and where only a minority are needed to guide the 'bot-based' economy?"

A more sanguine view is expressed by Stephen Gardiner: "The Industrial Revolution was another of those extraordinary jumps forward in the story of civilization." Vinnie Merchandani welcomes the advent of advanced robots and artificial intelligence (AI) by stating that "Machines will become more of our colleagues, and we should not be so worried about their increased presence in the future …if anything, they will take our outstanding workers and make them even better." Deborah Lupton is even more reassuring: "Humans will always have the need for affective and embodied interactions with other humans, which can never be replaced by robots."

The ambivalence towards the 4IR is perhaps best captured by Geoff Livingston: "I see the movement towards AI and robotics as evolutionary, in large part because it is such a sociological leap. The technology may be ready, but we are not – at least, not yet."

The dichotomous nature of the expected impact of the 4IR is co-created by a broad spectrum of vectors, including hyperbole, superstition, ignorance, propaganda, ideology, resistance to change, lack of foresight, ethics, prejudice, and historical misinterpretation. These sentiments and views are magnified in South Africa where poverty, unemployment, and inequality add further layers of complexity to the issue.

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THE GENERAL ENVIRONMENTAL CONTEXT

Lehman Brothers collapsed 10 years ago, leading to a major financial calamity, soon to be followed by the worst economic slowdown in the advanced economies since the Great Depression. Economic growth in these countries plummeted to almost -4% in 2009, trade fell in all the World Trade Organisation (WTO) members, and credit extension to the private sector contracted sharply. Governments' initial reaction was to aggressively stimulate economic activity through expansionary fiscal policies, which appeared to have had the desired effect: economic growth in the advanced economies averaged some 3% in 2010. This apparent triumph was, however, short-lived as governments in Europe resorted to painful austerity measures to curtail their high levels of indebtedness. Meanwhile, having lowered interest rates to virtually negligible levels, central banks introduced quantitative easing (essentially money creation).

The legacies of the Great Recession have been profound and manifold, often transcending mere economics. Not only have many economies failed to restore their growth paths to the pre-2008 levels, but we have also seen a gut-wrenching re-appraisal of the role and credibility of financial institutions. In many ways the economic narrative is being rewritten, and conventional wisdom is being turned on its head. Growing scepticism about figures of leadership and anti-establishmentarianism have spawned a ***surge in populism***. Politics is now less about "left" or "right", and more about "opening up" or "looking inward." Nationalism, and even ethnicism, is making a comeback. The modern world seems to be turning against liberal elites who are seen as "…self-serving and unable, or unwilling, to solve the problems of ordinary people." (The Economist, 2018:11). Meanwhile, the ever-more powerful China illustrates that economies can thrive under dictatorship.

We can now add to these ideological shifts a number of game-changers. More educated and skilled ***people are living longer*** and are therefore having to (wanting to) work longer, while the less skilled tend to live less longer and to stop work earlier. Smart, nimble machines (robots) and ***artificial intelligence*** (AI) may not replace humans in the work-place, but the era of life-long employment ("from womb to tomb") is probably coming to an end for more and more people.

The inhabitants of the planet are more ***empowered*** than ever before in history – through (now) almost universal primary education, marked progress in adult literacy, much improved health care, global access to social networks, and mobile money. The generation popularly known as Millennials is a prime illustration of the behavioural attitude displayed by empowered individuals. They are far more skeptical and cynical, they take little at face value, they are easily bored, they embrace change, they are techno-savvy, and they seek a balance between work and leisure. For them a career is but one ingredient of an envelope of experiences they wish to test and enjoy.

Millennials are also at the vanguard of a move towards the ***sharing economy***. This is the idea that ownership of assets (especially those not utilised for a significant portion of time) is less important than the ability to gain access to the use of the services or functions provided by those assets. People opt for sharing for one or more of the following reasons: social (to meet new people), convenience (to save time), economic (to lower costs), or to help save the environment. Regarding the latter, there is also a growing generalised awareness of the challenge humans are facing to ***survive prosperity***. Concerns about sustainability are no longer on the fringe of mainstream thinking as the number of middle-income consumers – with middle-income appetites and buying power – grows exponentially, especially in developing nations. Meanwhile, ***global climate change*** is no longer a figment of our imagination. The potentially destabilising effects higher surface temperatures – crop losses, drought, demographic shifts, hunger – are becoming apparent, notably in Africa.

Despite the unprecedented progress made in the last two decades at a global level with regard to education, health, and poverty, ***inequalities persist***. Less than 0.5% of the world's adult population controls some 40% of the world's entire wealth, while the share of wealth accruing to 3.2 billion (almost 70% of the total) amounts to less than 3.5%. Thus, although most people are better off than, in say, 2000, some are much better off than the rest. The same applies at a country level, with the income gap in the advanced nations expected to widen more rapidly than in the past.

Whatever our understanding of all these trends and forces might be, there can be little doubt that the world economic architecture of today and tomorrow (as well as those factors that influence and are influenced by the changing economy) is and will be vastly different from that of but a few years ago.

THE DEMOGRAPHIC CONTEXT IN SOUTH AFRICA

This section gives an overview of the demographic characteristics of the current and future population in South Africa.

NUMBER OF PEOPLE IN SOUTH AFRICA

The population of South Africa is still growing. Interesting trends highlighted in the graph below are the stagnation in the numbers of people aged 0-19 and 20-29, and the rapid growth in the number of people aged 30-59 and those older than 60.

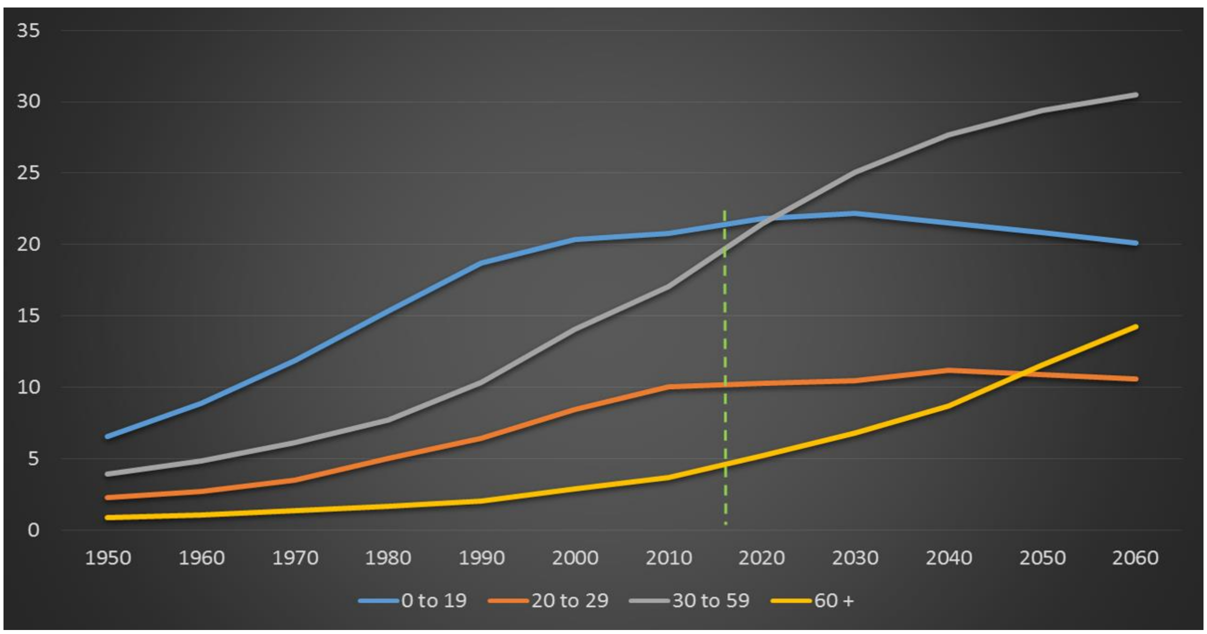

Figure 1: Projected numbers of 4 age groups in the South African population

Source: Compiled from UN Population Prospects, 2017 update

The South African population is projected to grow in an interesting manner toward 2060.

The 0-19 age group that showed the most significant increase over the past 65 years, is projected to stabilise and to even show a modest decline.

The age group 20-29 is also projected to stabilise at about 10 million.

The 30-59 age group will show rapid and consistent growth, increasing from current levels of about 20 million to 25 million by 2030 and 30 million by 2060.

People aged 60 and older are also projected to increase in a significant manner, from current levels of less than 5 million, to 10 million around 2045 and almost 15 million by 2060.

URBANISATION

The population of South Africa is urbanising at a rapid rate. 19 million people were living in rural areas in 2014; this number is projected to decrease to 14.3 million in 2050. In 2014, 34.2 million people lived in urban areas, projected to increase to 49.1 million by 2050.

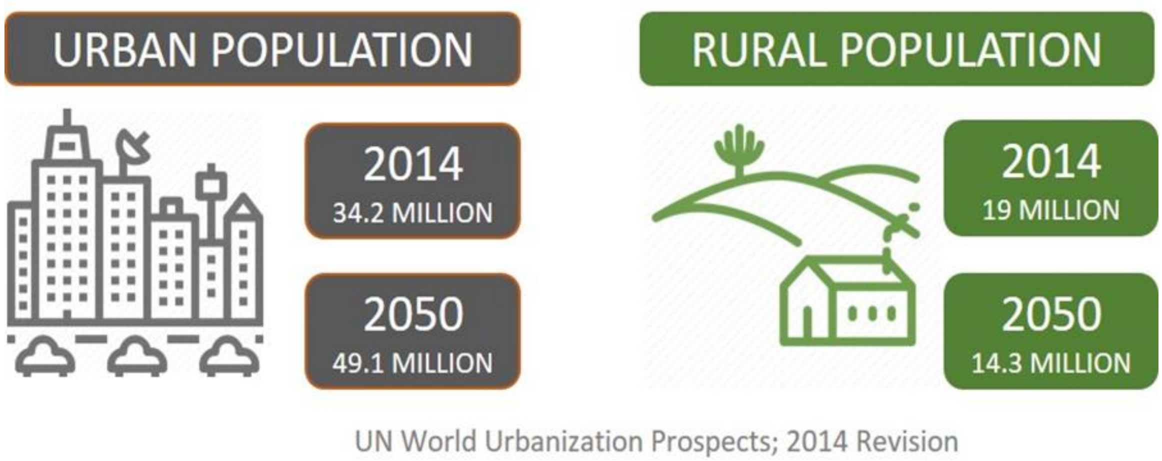

Figure 2: Projected numbers of South African urban and rural population, 2050

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WHO LIVES WHERE IN SOUTH AFRICA?

Of the almost 17 million individual households in South Africa, 79% occupied formal dwellings, 13% lived in informal dwellings and 7% in traditional dwellings. A breakdown of the statistics for each province is given in the table below.

Table1: Numbers of households per province and type of dwelling, South Africa 2016

Province	Formal dwelling	Traditional dwelling	Informal dwelling	Other dwelling	Total
Western Cape	1 593 891	9 401	320 022	10 302	**1 933 616**
Eastern Cape	1 154 843	471 699	130 885	15 828	**1 773 255**
Northern Cape	295 318	8 245	45 246	4 858	**353 667**
Free State	791 485	15 509	132 448	7 137	**946 579**
KwaZulu-Natal	2 090 067	520 244	245 167	20 166	**2 875 645**
North West	977 031	23 146	229 544	18 799	**1 248 519**
Gauteng	4 029 069	10 763	878 246	32 129	**4 950 207**
Mpumalanga	1 048 973	39 992	135 039	14 747	**1 238 751**
Limpopo	1 423 523	81 746	77 371	18 304	**1 600 945**
South Africa	**13 404 199**	**1 180 745**	**2 193 968**	**142 271**	**16 921 183**

Source: 2016 StatsSA Community Survey

LANGUAGES MOST SPOKEN IN HOUSEHOLDS OF SOUTH AFRICA

Although English is the language of trade and business in South Africa, it is not the most prevalent language spoken by people when they are at home. The graph below indicates the percentage of households that speak a particular language at home.

From the graph it is clear that English is the home language of only 8.3% of people in South Africa and, although it is the second language of most people, it creates interesting challenges (and opportunities) for communication in our country.

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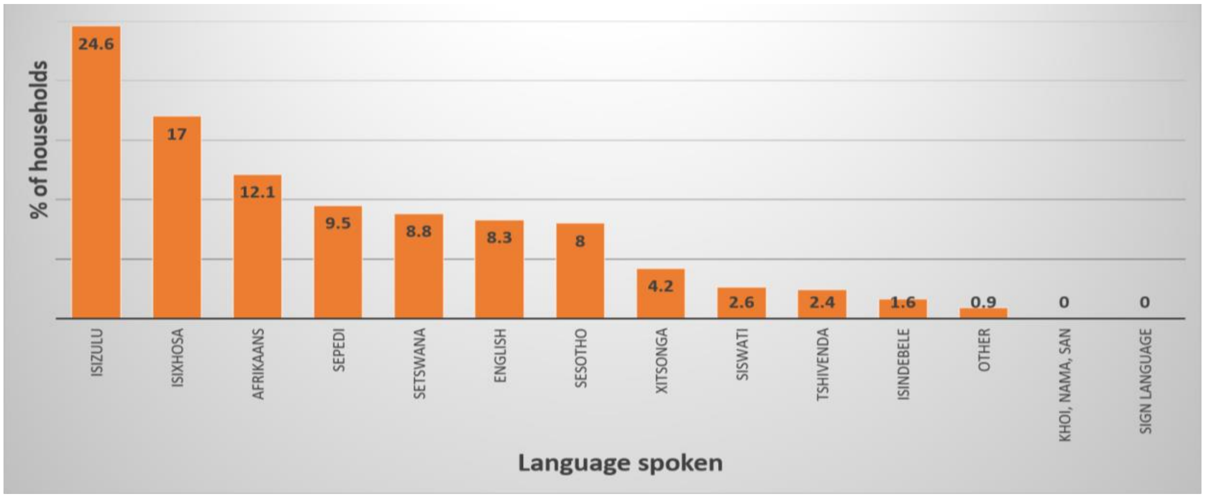

Figure 3: Language spoken at home in South Africa

Source: Compilation from 2016 StatsSA Community Survey

LEVELS OF SCHOOLING

Significant progress has been made in providing basic schooling to everyone in South Africa. However, there are still many people with low levels of education among the population. The table below indicates the distribution of persons of working age (15-64) by the highest level of education attained (bearing in mind that some of those aged 15-24 may still improve their education level).

The numbers clearly indicate that the bulk of people of working age in South Africa have completed less than 12 years of schooling.

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Table 2: Highest level of education attained, by employment status (numbers in 000's).

Highest level of education	Employed	Unemployed	Not economically active	TOTAL
No schooling	312	67	582	961
Less than primary	947	355	1 477	2 779
Primary completed	643	222	1 008	1 873
Secondary not completed	5 553	2 868	8 319	16 740
Secondary completed	5 410	2 102	3 321	10 833
Tertiary	3 473	482	588	4 543
Other	190	43	172	245

Source: StatsSA Labour Force Survey, 2019

THE DNA OF THE 4TH INDUSTRIAL REVOLUTION (4IR)

THE IMPORTANCE OF TECHNOLOGY

Technology is a key resource of profound importance to corporate profitability and growth, as well as being a prime determinant of a country's wealth, and hence its standard of living. Technological development is a pervasive process which shaped the 20th century in important and various ways, and will undoubtedly have an even greater influence on the 21st century. Its impact on society is such that it can be considered the prime driving force in the contextual environment of business, not only because of its direct impact, but also because of its indirect impact through the shaping of changes in the social, economic, political and natural/physical environments.

In order to understand technology, it must not only be seen as a universal (global) process, but also as various particular (discrete) processes. As a universal process, technological progress will be a pervasive evolutionary (incremental) process which transforms society over the long term. As a particular process, technological advance can be extremely disruptive to those organisations and individuals who are unaware of longer term patterns. Technological change that is not planned for properly are often perceived to be *revolutionary*. It can be competence enhancing if the organisation benefits from the change – often because the new technology fits into current practices, but it can also be destructive if it radically transforms process technologies or product technologies at a stage when the organisation is heavily committed (organisationally and financially) to old systems, processes and business models.

Schumpeter (1939) considered innovation as both the creator and destroyer of corporations and entire industries, noting the disruptive nature of technological change which could lead to waves of 'creative destruction'. He saw the role of entrepreneurs in seizing discontinuous opportunities to innovate, and he saw innovations as new combinations of producers and means of production, which include new products, new methods of production, opening up of new markets, utilisation of new raw materials, or even the reorganisation of a sector of the economy. *Evolutionary* (incremental) technological change is normally competence enhancing, because to *perceive* the change as an evolutionary process the decision-maker must have the appropriate technological scanning and monitoring systems in place that will enable an understanding of 'what is happening' and that will allow timely action.

To remain competitive, either at the leading-edge or as a follower, organisations need to pre--empt, or at least respond effectively to structural changes in their environments. Change in the technological environment is essentially structural. Dealing with structural change requires the utilisation of suitable environmental scanning procedures and methodologies, and especially appropriate organisational learning systems which are supported by a well-developed knowledge base for strategy-making purposes. Timely action to pre-empt or react to technological change could include the introduction of retraining programmes and a shift in current practices and processes. Nevertheless, a competence destroying evolutionary process of technological change is possible when the incremental changes are not correctly perceived or interpreted – the so-called 'frog-in-the-pan' effect. The level of impact of new technologies on an organisation can be turned to advantage by the appropriate management of technology.

TECHNO-ECONOMIC PARADIGMS

Technological transformations can be seen to be a powerful cluster of new, dynamic and synergistic technologies, which eventually bring about a significant restructuring (if not upheaval) of the economy, and thereby, of the social dimension in which the economy is embedded. This effect of technological transformations on the nature of the economy has been called 'techno-economic paradigms' by Perez (2002). The techno-economic paradigms that result from each technological transformation are briefly summarised in the right-hand column of **Exhibit** 4.1.

Exhibit 4.1

The five technological transformations

Technological trans-formation *(& origin)*	**Associated techno-economic paradigms**
First The Industrial Revolution *(Britain)* **1770-1800**	• Factory production • Mechanisation • Productive/time keeping and time saving • Fluidity of movement (as ideal for machines with water-power and for transport through canals and other waterways) • Local Networks
Second The Age of Steam and Railways (*Britain, spreading to Europe and the USA*) **1830-1850**	• Economics of agglomeration/Industrial cities/National markets • Power centres with national networks • Scale as progress • Standard parts/machine-made machines • Energy where needed (steam) • Interdependent movement (of machines and of means of transport)

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Third The Age of Steel, Electricity and Heavy Engineering (*USA and Germany overtake Britain*) **1860-1900**	• Giant structures (steel) • Economies of scale of plant/vertical integration • Distributed power for industry (electricity) • Science as a productive force • Worldwide networks and empires (including cartels) • Universal standardisation • Cost accounting for control and efficiency • Great scale for world market power • 'Small' is successful, if local
Fourth The Age of Oil, Synthetics and Mass Production (*USA, spreading to Europe*) **1930-1950**	• Mass production/mass markets • Economies of scale (product and market volume)/horizontal integration • Standardisation of products • Energy intensity (oil based) • Synthetic materials • Functional specialisation/hierarchical pyramids • Centralisation/metropolitan centres, suburbanisation • National powers, world agreements and confrontations
Fifth The Age of Information and Telecommunications (*USA, spreading to Europe and Asia*) **1980-?**	• Information-intensity (microelectronics-based ICT) • Decentralised integration/network structures • Knowledge as capital/intangible value added • Heterogeneity, diversity, adaptability • Segmentation of markets/proliferation of niches • Economies of scope and specialisation combined with scale • Globalisation/interaction between the global and the local • Inward and outward cooperation/clusters • Instant contact and action/instant global communications

Source: Perez, 2002:18.

Although all the techno-economic paradigms resulting from the information and telecommunications (ICT) age might not have transpired, and organisations and the global economy might still be influenced by certain paradigms, the new technologies lining up to dethrone ICT are impressive. Although the enabling technologies that follow do not necessarily present the next

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technological transformation, subsets of these enablers or even the convergence of some of these enablers, are certainly set to have a profound impact on the environment.

THE ENABLING AND NEW TECHNOLOGIES

An enabling technology is one which affects not only the area to which it is immediately directed, but one which also brings about fundamental and structural changes in many other areas (Coates *et al*, 1994:26). Historical examples of enabling technologies include the development of electric lighting, which has had, and is still having, a significant impact on the way in which we use time and space. Similarly, the substitution of horse-drawn transport by the automobile, the ship and by aeroplane has had far-reaching effects on our social systems.

The following are the current enabling technologies, and one enabling issue:

- Information technologies: The convergence of computers and communications.
- Biotechnology: New genetics and proteomics.
- Materials technologies: New materials and applications of materials.
- Energy technologies: Efficient use of resources, including renewable resources, to produce, transfer and store energy.
- Transportation technologies: An on-going underpinning set of technologies that enable transportation of all physical items.
- Environmentalism: An enabling issue – pollution, genetically modified organisms, limited resources.

The enabling technologies (called by some writers the dominant technologies) and the enabling issues are all interrelated. They are the major drivers of global change at present, and will continue to be so for the next 20 to 30 years, if not longer in some cases.

Robotics, currently dealt with under information technology, is an important sub-enabling technology. In fact, progress in the field of robotics coupled with the fact that it does not really fit in completely under information technology, could lead to it being seen as a sixth enabling technology in future. This is where the notion of the 4IR becomes salient.

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DIGITAL REACH IN SOUTH AFRICA

The following tables summarise the internet penetration rates and usage across South Africa.

Internet Penetration

Total number of active Internet users	30.81 million
Internet users as a percentage of the total population	54%
Total number of active mobile Internet users	29.20 million
Mobile Internet users as a percentage of the total population	51%

Key Digital Indicators

Total population	57.06 million (66% urbanisation)
Active social media users	18.00 million (32% penetration)
Unique mobile users	38.00 million (67% penetration)
Active mobile social users	16.00 million (28% penetration)

Web Traffic by Device

		Y-on-Y change
Laptops and desktops	25%	+45%
Mobile phones	71%	-9%
Tablet devices	4%	-16%
Other devices	0.05%	+67%

Devices used most often to access internet

Access the Internet most often via a computer or tablet	6%
Access equally via a smartphone and computer or tablet	10%
Access the Internet most often via a smartphone	69%

Source: GSMA, 2018; Statcounter, 2018; We are social, 18:15:38 UTC)

Percentage of adult population that currently uses each kind of device	
Mobile phone (any type)	95%
Smartphone	60%
Laptop or desktop computer	24%
Tablet computer	12%
Television (any kind)	82%
Device for streaming Internet content to TV	3%
E-reader device	1%
Wearable tech	2%

Source: GSMA, 2018

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THE SOUTH AFRICAN PROBLEMATIQUE

The predicament in which the South African economy finds itself can be attributed to a combination of external forces and internal, self-inflicted weaknesses. Regarding external forces, the desired economic growth path of 6% per annum for a period of at least 20 years has to be achieved in a global economic environment that is less friendly and more volatile than 10 years ago.

THE CRISIS-PRONE AND VOLATILE GLOBAL ECONOMIC ENVIRONMENT

There are indications that the global economy has entered a new era of more subdued growth – at least for the foreseeable future. The consumer and government responses to the excesses and over-exuberance engendered by significant debt accumulation during the first 15 years prior to 2008/09 have brought about slower economic growth in the advanced economies. Many less developed economies are also experiencing more moderate growth as a result of *inter alia* major structural adjustments (e.g., China); significantly lower commodity prices (e.g., Russia, Nigeria, Angola); and political and economic mismanagement (e.g., Brazil, Venezuela).

Further considerations include the future impact of major demographic changes, such as ageing in the advanced economies, and rapid urbanisation in Asia and Africa. The former has potentially profound implications for the sustainability of societies where the growth in the number of elderly people is outstripping the annual increase in the number of people of working age. At the same time, the 4th Industrial Revolution is changing not only the nature and duration of work, but possibly also questioning the very meaning of what it means to be human. Mason (2016) suggests that because of new technologies, capitalism as we know it is in decline and is likely to be replaced by an entirely new socio-economic system: post-capitalism. This utopian global system will be spearheaded not by the organised working class, but by the networked class who will harness zero marginal cost production, use copious amounts of real data to understand, model and test ideas for change, promote collaborative, non-profit forms of work, and ensure that everyone is paid a basic income. In this way, it is suggested, it is possible to create from the ashes of the Great Recession, a more socially just and sustainable global recovery.

Although South Africa was fairly immune to the financial shenanigans that were the prelude to the global 'Great Recession', the country was certainly strongly hit by the after-shock in the form of the impact on the real economy. In 2009 South Africa recorded a negative economic growth rate, bringing to an end the longest ever recorded upward phase of the business cycle. Western Europe, one of the major 'victims' of the Great Recession is also South Africa's major trade and investment partner. Economic decline in Europe translated into a significant decline in exports to that region. And for an open economy like South Africa that is bound to suppress economic activity. More than 900 000 jobs were lost – the highest proportional job loss in the world. The recovery since then has been sluggish, lacklustre and uninspiring.

The global recession, the ongoing tepid growth in Western Europe, the growth slowdown in China, the significant decline in resource prices, and a debilitating drought have undoubtedly inhibited South Africa's growth performance over the last eight years. These external factors are naturally beyond our control. What is more worrying, however, is the fact that these external constraints have highlighted a number of domestic – largely structural – obstacles to growth, development and job creation.

SELF-INFLICTED, INHERENT WEAKNESSES

In some ways SA has "painted itself into a corner" with regard to its socio-economic lethargy. Some of the underlying reasons are discussed below.

GREED

The country, and its stakeholders, are living beyond their means in the following ways:

- Domestic expenditure exceeds domestic production.
- Government spending exceeds government revenue.
- Exports exceed imports.
- Household expenditure exceed household income.
- Investment demand exceeds savings supply.

The loss of fiscal discipline since 2008 is of particular concern. In the period between 1995 and 2008, a large measure of progress was recorded with regard to the country's fiscal situation: government spending growth stabilised; government spending was re-prioritised; the country's tax collection effort became increasingly efficient; the budget deficit was been narrowed (relative to GDP) to acceptable levels; and the public debt ratio was reduced. These improvements enabled the government to embark upon a programme of fiscal expansion to counteract recessionary conditions. However, the large rise in government debt since 2008 (currently in excess of 50%), together with other fiscal developments, has attracted the attention of *inter alia* the well-known credit ratings agencies. The deterioration in South Africa's fiscal prospects is largely due to government expenditure decisions over the last eight years that are unrelated to the financial crisis Of particular concern is the fact that about 30% of the rise in the spending-to-GDP ratio can be attributed to government wages; 15% to goods and services; and 11% to transfers. This is in addition to repeated rescue packages for inefficient state-owned enterprises. Moreover, the contraction in economic activity (and therefore the tax base of the economy), together with the political inexpedience of lowering government spending, is more than likely to result in relatively high budget deficits in the next few years, with a concomitant rise in the government debt to GDP ratio. Meanwhile, the budget will come under increasing pressure as a result of a rising debt servicing burden.

South African consumers are also living beyond their means. Household consumption expenditure on goods and services has exceeded household disposable income for more than a decade. As a consequence, the household debt-to-disposable income ratio has averaged 80% since 2006, compared to a long-term average of between 50% and 60% in the previous few decades (SARB, historical series).

In addition,

- the ratio of household savings to disposable income has been negative since 2006; in 1992 it was as high as 6.1% (SARB, historical series);
- the ratio of foreign debt to GDP was 48.3% at the end of 2016, compared to 18.9% at the end of 2005 (SARB, historical series); and

- fixed investment spending in 2016 exceeded gross domestic savings by 3.4% of GDP (in 2002, savings exceeded investment by a factor of 2% of GDP) (SARB, historical series

The overarching and cross-cutting implication of the growing indebtedness of 'SA (Pty) Ltd' is that the country lives in perpetual hope that its various deficits will be financed by non-residents, at an affordable cost. Until about five years ago this outcome was generally achieved, as foreign savers found the country to be sufficiently attractive to warrant a meaningful investment in shares, bonds, plant, equipment and other forms of direct investment. But this might have been not so much a vote of confidence in South Africa, but rather a motion of no confidence in the short-term economic outlook then prevailing in the USA, Western Europe, and Japan. Today, investors are probably finding it more difficult to formulate good reasons for financing South Africa's fiscal, household, foreign and savings deficits. In fact, early in April 2017, two credit rating agencies decided that the sustainability of South Africa's government was too vulnerable to various social, economic, and political forces to justify the retention investment grade status. The new sub-investment ("junk bond") status will have a range of adverse effects on the country's ability to attract foreign investment, generate a faster growth trajectory, create jobs, and allocate public funds to the social wage.

On reflection, therefore, South Africa's relatively robust economic growth performance during the first few years of the 2000s was largely driven by consumer and investment spending, which, in turn, was accommodated by rapidly expanding debt levels. The latter are not sustainable; in fact, as both the household and government sectors attempt to restore the integrity of their balance sheets, growth in these sectors is being curbed.

IGNORANCE / MISCONCEPTIONS

Many South African stakeholders – including influential policy-makers – appear to unaware of a number of realities that shape the nature and performance of the economy, and its status in the global economy. For instance, while South Africa's primary sector (mining and agriculture) remains a crucial component of the country's economic make-up, its contribution to gross value added has declined significantly from over a third in the mid-1960s to less than 12% today (computed from SARB, historical series). In fact, annual growth in this sector has averaged less than 1% since the 1970s. By contrast, the services sector accounts for close to 70% of South Africa's gross value added.

A further example of ignorance, almost bordering on hubris, is the conviction that South Africa is "the gate-way into Africa." In actual fact, according to the World Bank (2017), when measured in purchasing power parity (PPP) terms, South Africa's economy is now only the third largest in Africa, after Nigeria and Egypt. In addition, South Africa has, in the last few years, relinquished its position as the most competitive nation in Africa to Mauritius (1st in Africa) (WEF, 2017).

PRODUCTIVITY CONSTRAINTS

When all is said and done productivity is a prerequisite for international competitiveness and economic growth and development. Labour productivity is the most common measure of productivity, largely because labour costs constitute the largest share in the value of most products (in South Africa wages and salaries represent more than 50% of the cost of producing GDP). Capital productivity measures the output per unit of capital employed (fixed capital, inventions and land resources). Total factor productivity (TFP) measures the efficiency of all inputs to a production process; i.e., it not only labour or capital. Its level is therefore determined by how efficiently and intensely inputs are utilized in production. It plays a critical role in explaining economic fluctuations, economic growth and cross-country differences in per capita income. Factors contributing to TFP growth include innovation, the availability of skilled labour, the cost of conducting R&D, the availability of technology (and the efficiency with which technology is used), and the availability and ability of management to harmoniously and efficiently blend the available inputs.

The productivity of labour in South Africa has, at best, stagnated over the last 10 years, while remuneration growth has increased by more than 6% per annum. As a result the unit costs of

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labour have escalated to be almost three times higher today than at the beginning of the 21st century. All of this has occurred during a period of near-recessionary conditions and chronically high unemployment.

South Africa's TFP performance over the last three decades has been disappointing when considered according to its own historical development, as well as when compared with other countries of a similar nature. There were 15 annual declines in the country's TFP between 1990 and 2014. Consequently, the level of TFP in 2014 was 22.6% lower than in 1989 (computed from The Conference Board Total Economy Database; Adjasi, 2015).

The reasons for South Africa's sluggish TFP performance can be attributed to, *inter alia*, low efficiencies in the use of labour and capital; a variety of challenges (including regulatory and financial barriers) that prevent businesses from maximizing their potential; and a low competitive base.

MEDIOCRITY AND ENTITLEMENT

There is a sense (and a risk) that South Africans are willing to tolerate mediocrity. For instance, the country is clearly stuck in a middle-income trap (MIT). An MIT is typically described as a condition, where middle income countries have '…bursts of growth followed by periods of stagnation or even decline, or are stuck at low growth rates. Instead of steadily moving up over time, their GDP per capita simply gyrates up and down' (Kharas & Kohli, 2011:282). This is in contrast to a steady rise in GDP per capita over time to higher income levels. It is also argued that countries are caught in an MIT because, with rising wages and declining competitiveness, they are unable to compete with low-income, low-wage economies in manufactured exports, or with advanced economies in high skill innovations. Put differently, countries in an MIT are not able to make a timely transition from resource-driven growth to productivity-driven growth (Kharas & Kohli, 2011:282).

Felipe (2012) analyses historical income transitions to determine the number of years that a country has to be in the lower and upper middle income groups to fall into the MIT. His findings are that a country has to spend more than 28 years in the lower middle income group to fall in the MIT; and more than 14 years in the upper middle income group to fall in the MIT.

The implications are that a country that becomes lower middle income has to record an average annual economic growth rate of at least 4.7% to avoid falling into the lower middle income trap, while a country that becomes upper middle income needs to grow at an average annual rate of at least 3.5% to avoid falling into the upper middle income trap.

Felipe (2012) categorises 52 middle income countries in 2010 into three categories, *viz*, those in the MIT; those at risk of getting into the MIT; and those likely to avoid it. For countries in the lower middle income trap it is largely a Latin American and African phenomenon; 19 countries (**including South Africa**) have been there for at least four decades; Botswana and Sri Lanka are borderline cases, in the sense that they are at the 28-year threshold; South Africa is expected to be in the lower MIT for another two decades; and Brazil, Colombia, Iran, Jordan, Panama, Peru, Sri Lanka and Tunisia could graduate to upper middle income status within the next 10 years if their income per capita growth rate recorded between 2000 and 2010 is maintained.

Kharas and Kohli (2011:284) point out that '… the continuation of the very strategies that help the countries grow during their low-income stage prevents them from moving beyond the middle-income stage'. It therefore makes sense to compare the growth strategies necessary for low income economies with those needed for middle income economies. According to Kharas and Kohli (2011) the major difference between the growth strategies of low income and middle income countries is that the latter focus more on demand. Often in middle income countries traditional exports cannot expand be-cause wages are higher and competitiveness declines. This means that export growth requires the introduction of new production processes for new markets. This, in turn, requires an understanding of the quality and price preferences of the global market. Since this is a daunting task most firms often start by developing this understanding in domestic markets. If successful, they can then develop into global brands. It appears, therefore that a stagnating middle class (and, by implication a skewed concentration of income) stunts growth in middle income countries.

Also important in middle income countries are innovation and product differentiation. All in all, domes-tic demand and new export demand are key drivers of growth in middle income countries, while a transition must also occur toward service sector firms. Thus, in order to avoid becoming trapped, middle income countries need to develop *inter alia* modern and agile institutions for property rights, capital markets, venture capital and competition. This has to be complemented by a critical mass of highly skilled people able to innovate.

This tacit willingness to accept mediocrity as a norm, is reinforced by a growing psychosis of entitlement. The reality is that, as much as we might not agree, no-one – including the world – owes anybody anything. Labour, for instance, is not the only production factor that can be used to generate output; producers will only use labour if it is the best way to enhance the "bottom line." It can also be argued that entitlement demands are at least partly responsible for low education standards, which further entrench mediocrity.

INDUSTRIES AND ECONOMIC ACTIVITIES IN SOUTH AFRICA AFFECTED BY THE 4IR

GLOBAL TRENDS

The ***world of work*** will unfold in accordance with the combination of empowerment in the work place, and the rate of technology uptake. At the one extreme the kind of work will be largely similar to the 20th century norm of full-time employment, with goods and services being produced and delivered in traditional ways. At the other end of the spectrum the mode of work will be via platforms, projects, gigs, and tours of duty, with goods and services being produced and delivered by new technologies such as artificial intelligence and personal devices.

Regardless of the work-mode scenario that materialises, in order to become and remain relevant, workers will need a higher quality education that integrates general knowledge in both the arts and sciences with emerging technologies. Competencies in creativity, tolerance, appreciation of diversity and social skills will also form part of a high quality education system. The ***interaction between human capital and technology*** is crucial as improvements in productivity are achieved by combining technology and human capital, especially skilled labour. These thoughts are particularly relevant for most African countries where the skills sets that drive global competitiveness (viz., functional scientific and technical knowledge, and managerial skills) are often neglected in favour of nominal scientific and technical knowledge, which is "… purposeless; an end in itself; with no instrumental value beyond scientific curiousity." (Onyeiwu, 2015).

Turning to an ***industry/ sector focus*** there is a better than even chance that the ***business services sector will grow faster than the overall economy***. Should sustainability concerns start to dominate the global and national discourse, along with the need to mitigate the effects of climate change, a revolution with regard to energy technology will lead to a ***low-carbon, green economy***. In this case the mining and quarrying, and defence sectors would be relative losers, while the business services and communications sectors would benefit. However, within these broad sectors specific industries could suffer or benefit. Opportunities could, for instance, open

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up in corporate responsibility reporting services, sellers of electric cars, trading of carbon permits, sustainable forestry, and companies specialising in energy efficient buildings and retrofitting. Losing industries could include paper-based media, the aviation industry, restaurants, foreign tourism, meat and poultry farming, oil equipment and mining.

In the event of another ***debt-driven financial collapse***, leading to a world-wide depression more severe than the 2008 crisis, the ***manufacturing, hospitality, and construction sectors would probably suffer most,*** while health and social services, and business services would benefit relative to other sectors.

Market opportunities also abound if societies seriously heed the objectives embodied in the ***Sustainable Development Goals*** (SDGs). These could include reducing food waste, using technology in large-scale farming, urban agriculture, electric and hybrid vehicles, cultural tourism, durable and modular buildings, non-energy intensive industries, green chemicals, grid interconnection, tele-health, tele-education, low-cost surgery, weight management programmes, and electronic medical records.

In the light of the mounting environmental challenges that loom ahead, as well as the rapid increase in the demand for food protein to feed a growing population of middle-income consumer, the ***ocean economy*** offers meaningful prospects for new sources of growth, jobs, and innovation. In addition to established ocean-based industries such as shipping, port activities, ship-building, dredging, industrial fisheries, and coastal tourism, new industries are emerging, such as industrial marine aquaculture, offshore wind energy, ocean renewable energy, marine and seabed mining, ultra-deep water, oil and gas, marine biotechnology, and high-tech marine services.

SOUTH AFRICAN TRENDS

Turning closer to home, ***South Africa*** has traditionally sought to grow the economy and create jobs through the agricultural and extractive sectors, which still account for more than half of the country's export earnings. In fact, despite the rapidly declining share of agriculture and especially mining in South Africa's total gross value added, the country's ***revealed comparative***

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advantage (calculated by dividing the share of a particular commodity in a nation's total exports, by the share of that commodity in world exports) still lies mainly in live animals, vegetable products, wood, pulp and paper, precious stones, and base metals – little of which entails significant beneficiation

By contrast, South Africa's ***revealed comparative disadvantage*** lies in product lines that generally require some degree of beneficiation. These include textiles and clothing, footwear, machinery and appliances, and plastics and rubber. As an upper middle-income country, aspiring towards a higher sustained growth path that is pro-employment and pro-development, it is imperative that the country should move toward the production of high-valued goods and expand manufacturing for local, regional, and international markets. As it is, South Africa seems to be ***stuck in a middle income trap***, struggling to compete internationally in the export of low value goods with low income countries where unit labour costs are significantly lower; or with high income countries in the export of high value goods because of skills, technological and logistical deficits.

Broadly speaking, three critical transitions are required to escape a middle-income trap, *viz.*

- from diversification to specialisation in production;
- from physical accumulation of factors to productivity-led growth; and
- from centralised to decentralised economic management (Kharas & Kohli, 2011).

Although South Africa is one of the first countries outside the traditional core (North America, Western Europe and Japan) to have reached middle income status, it has arguably failed to adjust its growth strategies accordingly. For instance, while the ***South African economy*** has benefited in the past from diversification, it has largely ***failed to specialise*** in production. The virtues of specialisation include allowing countries to enjoy economies of scale, thereby offsetting the costs associated with higher wages; promoting rapid innovation; and introducing new products and services based on the capabilities of firms. In East Asia, governments played a role in this regard by, for instance, building export processing zones for specialising in electronics. Specialisation also contributes to the redeployment of resources from low-productivity to high-productivity activities. Unfortunately, there is limited evidence of meaningful specialisation in the South African economy.

Another important component of a middle income growth strategy is an emphasis on total factor productivity (TFP) growth. This requires ***major changes in the entire ambit of educational activities.*** In a knowledge and innovation economy (Industry 4.0), basic skills are no longer sufficient. Advanced secondary and tertiary education needs to equip the labour force with the skills to generate ideas and shape and develop technology to fit the changing world. High quality professionals are also crucial – scientists, engineers, lawyers, doctors, architects, teachers, accountants and bankers. The ***shortcomings in and of South Africa's education system***, which are well-known, clearly impede the country's ability to accumulate a critical mass of professionals able to take the country into the knowledge and innovation era.

In sum, there can be little doubt that the future structure of the South African economy will be moulded, at least in part, by the inescapable reality and implications of the rapidly changing global economic landscape. At the same time, it is crucial to constantly remind ourselves that the country has a ***dual-logic nature***. We are a microcosm of the entire global socio-economic construct, with advanced structures and social systems operating alongside and amidst poverty, chronic unemployment, and significant inequalities. This means that economic growth and development, as well as job creation will, in the years that lie ahead, be driven not only by new and emerging smart and resource saving activities, but also more "traditional" pursuits. Even here, however, a major paradigm shift is required; for instance, the promotion of a more labour-absorbing industrialisation path with a particular emphasis on tradable labour-absorbing goods and services, and economic linkages that galvanise employment creation. In a similar vein, further diversification and specialisation is required to reduce our reliance on commodities (raw material) by adding value so as to move into the production of good and services that can compete in export markets and against imports. In this regard there is significant growth potential (read: unutilised capacity) in agri-processing, service exports, and manufacturing).

THE DYNAMICS AND DIMENSIONS OF SOUTH AFRICA'S LABOUR MARKET

Unemployment: The numbers

The consistently high level and rate of unemployment in South Africa is indicative of a deficit – the demand for jobs exceeds the supply thereof, reflecting a systemic inability to provide employment opportunities for a rapidly growing labour force. The official (strict) definition of unemployment defines the unemployed as those persons in the economically active population (15-64 years old; working formally or informally or self-employed, or unemployed) who did not work during the seven days prior to the interview, who want to work, who are available to start work within a week of the interview, and who have taken active steps to look for work or to start some form of self-employment in the four weeks prior to the interview. The labour force participation rate (LFPR) is the proportion of the working age population (15-64 years) that is economically active. The labour absorption rate is the proportion of the working age population that is employed.

The October *Labour Force Survey* for 2018 showed that during the third quarter of 2018

- 15.4m (40.5% of all persons of working age, including discouraged work seekers) were not economically active;
- 2.7m (7.2% of persons of working age) were discouraged work seekers;
- 6.2m (16.4% of persons of working age) were unemployed; and
- 16.4m (43.1% of persons of working age) were employed.

According to the strict definition, 27.5% of the economically active population was unemployed at the end of the third quarter of 2018. Of particular concern is the very limited progress made in this century in reducing unemployment. The number of people of working age (15-64 years) increased by 9.9m between March 2001 and September 2018. The economically active population (EAP), or labour force, rose by only 5.9m over the same period, which meant that the non-EAP

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increased by 3.99m. The latter figure may, however, be somewhat deceptive as it includes discouraged work seekers; a volatile quantity that is influenced by work seekers' perceptions of their likelihood of finding employment. Nonetheless, it is disappointing that during a 17-year period when the GDP expanded by some 60%, the net increase in employment was only 33% – from 12.3m in March 2001 to 16.4m in September 2018. Since the size of the EAP has risen faster than the increase in employment, the unemployment rate in September 2018 (27.5%) was slightly higher than in 2001 (26.4%). Both the labour force participation rate and the labour absorption rates in September 2018 were virtually unchanged compared to March 2001, at 59% and 43% respectively (**Table 3**).

At a provincial level Limpopo (18.9%), the Western Cape (20.4%), and KwaZulu-Natal (23.0%), recorded the lowest unemployment rates in September 2018, while 30% or more of the labour force in Mpumalanga, the Eastern Cape and the Free State was unemployed (**Table 4**). Unemployment is the highest among women, those aged 15–34 years, the black African population group, and those with educational attainment of less than matric. The unemployment rate is lowest for the white population group. (See also **Figure 4** for a demographic profile of the unemployed in September 2018).

As long as the growth in the supply of labour exceeds the rate of growth in job creation, the unemployment rate will remain high. The fact that the formal sector has been responsible for the bulk of the increase in total employment since 2003 is encouraging, since it suggests the re-establishment of the expected link between formal sector economic growth and job creation. Youth unemployment is exceptionally high (in excess of 50%), creating the potential for growing social tension and political volatility.

Table 3: Labour force participation, absorption and unemployment, Mar 2001, Mar 2003, Mar 2008, Mar 2010, Mar 2013 and Sep 2018

Indicator	Mar 2001	Mar 2003	Mar 2008	Mar 2010	Mar 2013	Sep 2018
Labour force participation rate (%)	60.8	58.3	58.2	54.6	54.8	59.5
Labour absorption rate (%)	45.8	41.2	44.5	40.8	41.0	43.1
Unemployment rate (strict definition) (%)	24.6	29.3	23.5	25.2	25.2	27.5

Sources: StatsSA, 2010; 2015; 2018.

Table 4: Unemployment rate by province, Mar 2001, Mar 2003, Mar 2008, Mar 2010, Mar 2013 and Sep 2018

Province	Mar 2001 %	Mar 2003 %	Mar 2008 %	Mar 2010 %	Mar 2013 %	Sep 2018
Western Cape	20.9	22.0	18.1	21.8	23.3	20.4
Eastern Cape	30.6	33.3	28.1	27.9	30.2	35.6
Northern Cape	21.7	25.0	24.8	29.9	29.6	27.0
Free State	24.0	27.5	25.0	27.8	31.6	36.3
KwaZulu-Natal	19.6	28.2	22.7	20.9	21.1	23.0
North West	22.7	26.8	22.3	27.9	26.5	28.0
Gauteng	27.9	31.2	22.7	26.9	25.2	29.6
Mpumalanga	19.1	23.3	23.7	27.7	29.4	32.5
Limpopo	30.7	42.3	31.7	22.4	20.3	18.9
RSA average	**24.6**	**29.3**	**23.5**	**25.2**	**25.2**	**27.5**
Sources: StatsSA, 2010; 2018.						

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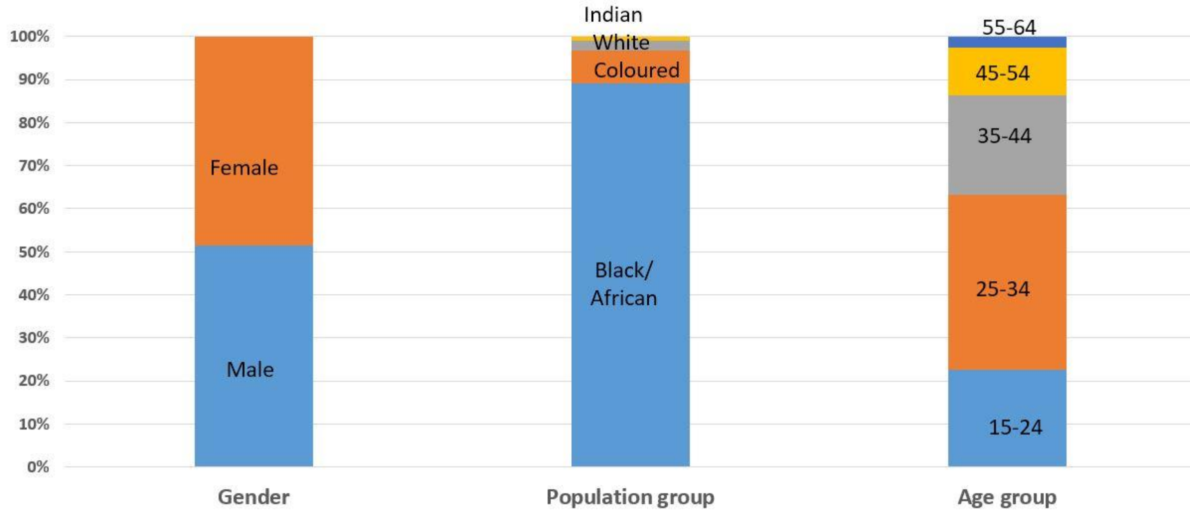

Figure 4: **Percentage of unemployed by demographic profile, Sep 2018**
Source: StatsSA, 2018.

Unemployment: The reasons

Conventionally there are four kinds of unemployment: Frictional (when people leave a job and are not able to find employment in another job straight away), seasonal (certain jobs or occupations only require workers at certain times of the year), cyclical and structural. The last two, discussed in this section, are particularly significant in the South African context. Cyclical unemployment is related to the general strength and vitality of the economy. In the event of a recession (downswing), the demand for goods and services tends to grow at a slower rate, and producers require fewer production factors – including labour – to meet a lower level of consumer demand. Structural unemployment occurs when there is a significant gap between, on the one hand, the education, skills, expertise, etc, required for a job, and, on the other hand, the availability of appropriately qualified workers to fill these posts.

During the 1960s employment in the private, non-agricultural sector increased by 1.44% for every 1% increase in value added in the private, non-agricultural sector. During the 1970s and 1980s this coefficient was 1.6% and 2.2% respectively. Thus, between 1960 and 1990 the relationship between economic growth and job creation was as expected – an increase (decrease) in output resulted in an increase (decrease) in employment – indicative of cyclical explanations for employment growth. This relationship has, however, become far more volatile and tenuous since the beginning of this century (**Figure 5**). In the 1990s, for instance, for every 1% expansion in combined gross value added in mining, manufacturing, construction, trade and finance, employment expanded by only 0.2%. During the first 17 years of the 21st century a 1% expansion in gross value added in the same sectors, yielded – on average - employment growth of only 0.25%. In the manufacturing sector – a traditional source of employment for semi-skilled workers – every 1% expansion in gross value added during the first 17 years of this century was accompanied, on average, by a 0.7% decline in employment. This means that while value added in manufacturing increased by 35% between 2000 and 2017, employment in that sector actually fell by 20%.

Moreover, while the total employment level in 2017 in the mining, manufacturing, construction, trade and finance sectors was 531 327 higher than in 1990, most of this increase can be attributed to job creation in the finance and trade sectors. By 2017 there were 312 510 and 568 482 fewer people working in the mining and manufacturing sectors respectively than in 1990. In essence, this is indicative of structural explanations for unemployment – the changing structure of the economy has had a profound effect on the demand for labour. Almost 72% of those employed formally are engaged in services sector activities (see **Table 5**), and generally speaking, the services sector requires a different set of skills and level of expertise to those needed in the primary and secondary sectors.

An additional structural impediment to job creation is rooted in the fact that since the late-1990s, the cost of capital (as embodied in the prime rate) has fallen, while the cost of labour (as reflected in remuneration per worker) has increased. As a consequence, capital has become relatively more attractive than labour as a production factor.

There is a clear shift in terms of the demand for labour from 'brawn to brain'. The structural change – which is an ongoing one – in the demand for labour in South Africa can be attributed to a number of factors, including changes in production methods or techniques (eg, people are replaced by labour-saving machines); changes in the type of goods and services being

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produced; foreign competition (which is particularly relevant today in the light of the phasing out of protectionism); structural decline in certain industries (eg, falling gold output); low labour productivity (compared to foreign competitors); high minimum wages; and low and/or inappropriate skills levels.

Table 5: Employment by main industry, March 2001-Sep 2018

Sector	Mar 2001	Mar 2003	Mar 2005	Mar 2010	Mar 2011	Mar 2013	Sep 2018
Primary sector	11.7	10.8	9.5	7.4	7.0	8.1	7.6
agriculture, forestry & fishing	7.8	6.9	6.2	5.1	4.6	5.4	5.1
mining & quarrying	3.9	3.9	3.0	2.3	2.4	2.7	2.5
Secondary sector	20.6	21.7	22.9	21.8	22.3	21.3	20.7
Manufacturing	14.8	15.8	15.1	13.3	13.7	12.9	10.5
electricity, gas & water	0.7	0.6	0.8	0.5	0.7	0.9	1.0
Construction	5.1	5.3	7.0	8.0	7.9	7.5	9.2
Tertiary sector	67.8	67.4	67.9	70.8	70.6	70.8	71.7
wholesale & retail trade	26.9	21.9	23.5	22.1	22.6	21.0	20.2
transport, storage & communication	5.5	5.9	5.6	6.0	5.5	6.0	6.1
financial services	9.4	10.0	10.3	12.8	12.4	13.1	15.3
community, social & personal services (incl. government)	16.8	19.2	18.7	20.8	21.6	22.6	22.4
private households	9.5	10.4	9.8	9.1	8.5	8.1	7.7

Sources: Computed from StatsSA, 2008; 2010; 2011; 2013; 2014, 2015, 2018.

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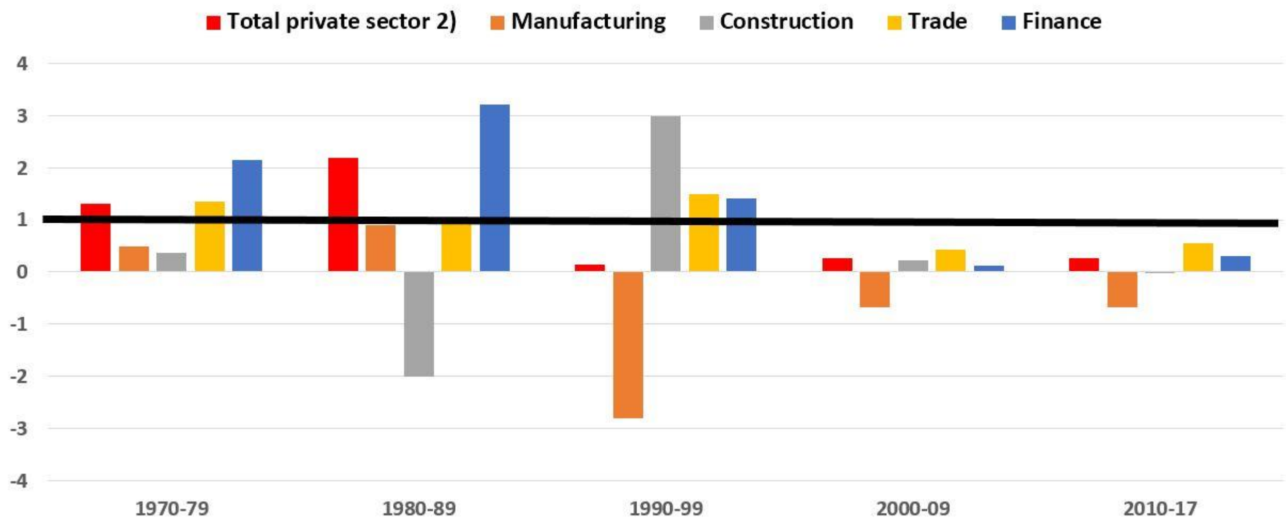

Figure 5: Employment elasticity of growth in value added[1)] (constant 2010 rands), 1970-2017
Notes: **1)** % change in employment/% change in value added.
2) Mining, manufacturing, construction, trade and finance.
Source: Computed from SARB historical series.

Unemployment: Atypical outcomes

A 2011 IMF research paper attempts to identify and explain differences across countries in labour market outcomes. On average, employment in the sample countries listed in **Table D** expanded by 1.6% per annum between 2000 and 2009. By contrast annual job growth in South Africa was 0.7%, one percentage point below the median of the sample. If South Africa's job growth rate had matched the median country, it would have had 1.3m more jobs during this period.

Column 4 in **Table 6** shows the accumulative change in the employment-to-working age population ratio between 2000 and 2009. On average, the sample countries saw job growth exceed working age population by 1.4 percentage points, which implies an increase in the labour absorption rates of these countries. In fact, most of the sample countries managed to create more jobs than the number required to absorb the increase in the population of working age. A notable exception is South Africa where employment creation failed to absorb the new inflows of people of working-age population.

By dividing the sample countries into two groups – fast and slow job creators between 2000 and 2009 – the IMF (2011b) establishes those factors that are decisive for employment creation. Three categories of drivers are identified, *viz*, the macro-economic environment, labour market conditions, and social and human capital indicators. South Africa is listed separately. Not surprisingly, fast job creators experience favourable macro-economic conditions, with higher growth and significantly lower inflation. In addition, fast job creators experience real effective exchange rate depreciation (or less appreciation compared with slow job creators), and tend to record current account surpluses.

South Africa's performance compares unfavourably in a number of respects:

- Economic growth is lower than even the median of slow job creators.
- Inflation is higher than the median for slow jobs creators.
- The real effective exchange rate (REER) depreciated more than in most other countries, but average annual job growth was slower than the average for even slow job creators.
- Despite the more pronounced REER depreciation, South Africa's current account balance was significantly weaker than most. In fact, at 29.7% of GDP, the country's export-to-GDP ratio was lower than the median for slow job creators.
- The ratio of gross fixed capital formation to GDP was significantly lower than for most other countries.

Although both groups display a similar level of labour market rigidity, fast job creators display a more co-operative relationship between employers and employees. The latter is poorer in South Africa than in the case of slow job creators. **Table 7** reflects a number of indicators that do show a discernible difference between fast and slow job creators. South Africa's performance shows up poorly in many aspects:

- Union density is 25% higher than the median for slow job creators.

- Hourly pay is 12% higher than the median for slow job creators.
- The ratio of minimum wage to average output is double the median for slow job creators.
- The minimum wage for young workers is almost four times higher than that of fast job creators.
- The cost for redundancy dismissal is significantly lower than in most other countries (fast job creators tend to have a higher severance package, reflecting the fact that firing costs have a larger marginal impact on firms' propensity to fire than to hire).
- The share of public sector employment is considerably higher than in other countries.

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Table 6: Job creation in emerging markets, 2000-2009

Country	Job creation		Change in employment to working age population ratio		Employment to output ratio	
	Average employment growth (%)	**Rank**	**2009 minus 2000**	**Rank**	**Average growth (%)**	**Rank**
India	3.0	1	2.4	10	-1.9	8
Peru	2.9	2	5.9	2	-2.3	10
Philippines	2.7	3	0.9	12	-1.6	6
Israel	2.7	4	3.7	7	-0.2	2
Argentina	2.5	5	4.1	5	-1.3	3
Chile	2.2	6	2.4	11	-1.3	5
Thailand	2.1	7	10.3	1	-1.8	7
Brazil	2.0	8	2.8	8	-1.3	4
Malaysia	1.9	9	-3.5	19	-2.3	11
Indonesia	1.7	10	0.3	13	-3.2	17
Colombia	1.6	11	-0.9	15	-2.8	16
Poland	1.2	12	4.1	4	-2.6	12
Korea, Rep of	1.2	13	4.0	6	-2.6	13
Mexico	1.1	14	-2.5	16	-0.1	1
China, PR (mainland)	0.9	15	-2.6	17	-8.7	20
Russian Federation	0.8	16	4.4	3	-3.9	18
South Africa	**0.7**	**17**	**-3.1**	**18**	**-2.8**	**15**
Turkey	0.5	18	-5.7	20	-2.8	14
Ukraine	0.0	19	2.5	9	-4.1	19
Hungary	-0.2	20	-0.8	14	-2.2	9
Average	1.6		1.4		-2.5	
Median	1.7		2.4		-2.3	
Correlation with job creation			0.4	0.4	0.4	0.6

Source: IMF, 2011b:4.

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Table 7: Labour market statistics for fast and medium job creators, and South Africa

	Union density (union members as % of total employment)	Hourly pay in manufacturing (2008 US$)	Minimum wage/ average value addition	Minimum wage for a 19-year old worker or apprentice (US$ per month)	Share of public sector employment (%)
South Africa	**30.6**	**5.3**	**70**	**516**	**24.9**
Mean					
• **Fast job creators**	9.7	1.7	28	140	11.0
• **Slow job creators**	24.3	4.4	35	312	14.6
Median					
• **Fast job creators**	11.5	5.2	28	228	11.6
• **Slow job creators**	34.1	6.1	35	317	16.5

Source: Adapted from IMF, 2011b:9.

Unemployment: Capital deepening

From a production point of view, economic growth is a function of the availability and quality (competence) of resources. Historically, capital and labour have been the two principal production factors in South Africa. Over the last few decades, however, capital deepening (the process whereby the amount of capital per worker increases) in South Africa has been accompanied by an increased demand for (mainly) imported technology and highly skilled labour, and a secular decline in demand for the country's abundant (and growing) pool of relatively unskilled labour resources. The capital-output ratio measures the relationship between the country's capital stock and its annual output, while the capital-labour ratio measures the amount of capital per worker employed.

Since the beginning of the Industrial Revolution there has been a general tendency towards capital deepening. This means that every unit of production has required increasingly less labour and more capital investment. In South Africa, comparatively high labour costs per unit of labour – especially since the mid-1970s – have encouraged the introduction of labour saving technologies, despite an over-supply of unskilled labour. The trend towards capital deepening in the 1970s and 1980s was supported by, *inter alia,* the structure of the consumer market, at times, negative real interest rates, and a tax system, which allowed for generous capital allowances.

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In 1975 R566 400 worth of capital stock (in real terms) was required for every one job opportunity. This figure fell to R581 000 in 1989, subsequently embarking on a generally upward trend to reach R817 460 in 2017. The implication is that the capital stock required to support one job in 2017 was 43% more than in 1975 (**Figure 5**).

From the mid-1970s to 2000 between 6 and 7 workers were employed for every R1m worth of value-added in the non-agricultural private economy (mining, manufacturing, construction, trade, and finance); by 2017 only 4.2 workers were required. This implies that production has become far less labour intensive (see **Figure 6).** The finance sector is the least labour intensive, and the manufacturing sector the most.

It is clear that a significant increase in annual capital formation (investment) is required to absorb new job seekers each year. This will require a much-improved domestic savings performance, as well as the ability to attract a considerably larger portion of available foreign savings.

It has been argued that South Africa has over-invested in capital-intensive manufacturing industries (particularly between 1972 and 1990) and that this over-investment has resulted in inappropriately high levels of capital intensity and poor employment performance. In addition, such over-investment failed to acknowledge an imperative to make associated investments in human development, education and training.

However, it is important to note that even in industrialised nations it is becoming increasingly difficult to maintain employment in manufacturing. Thus, although South Africa's manufacturing sector certainly has scope for expansion (especially in export-oriented activities and the informal sector), in the longer run the employment problem will have to be addressed in other sectors of the economy; the manufacturing sector is unlikely to make a major contribution.

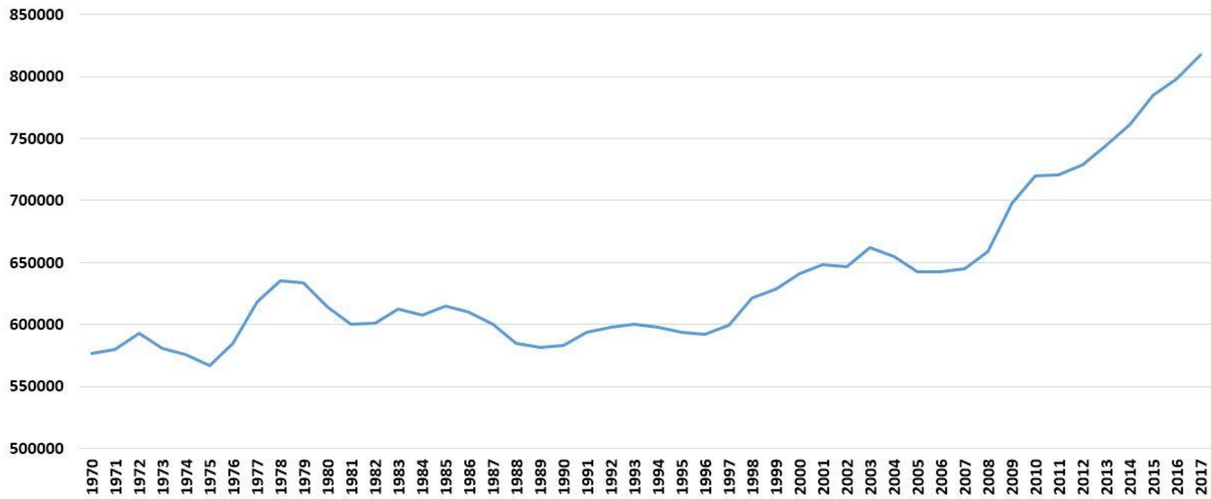

Figure 5: Average capital stock per worker, 1970-2017
Source: Computed from SARB historical series.

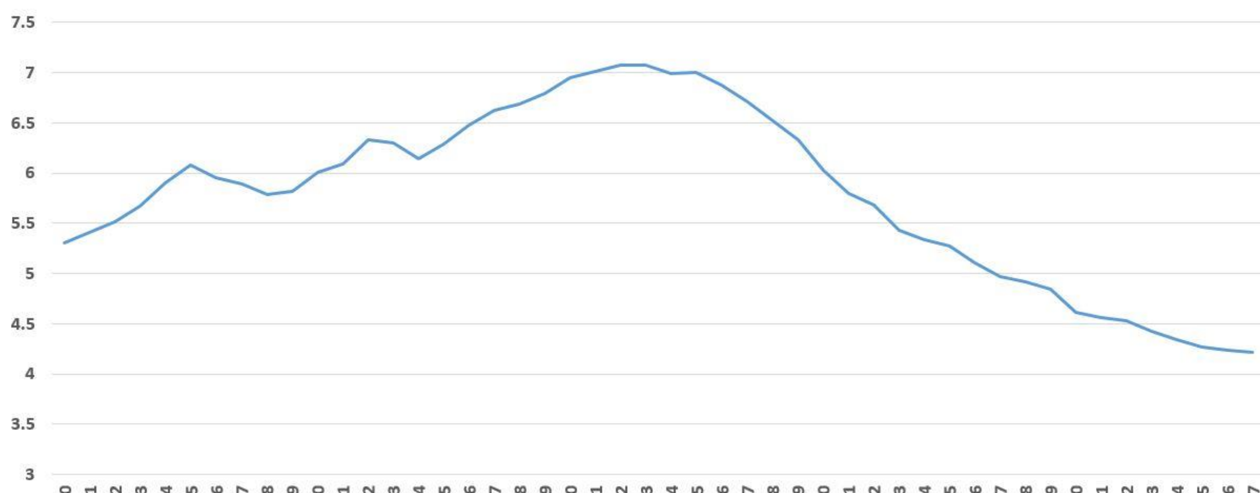

Figure 6: Number of workers per R1m of gross added value in the private non-agricultural sector [1)], 1970-2017
Note: 1**)** Mining, manufacturing, construction, trade and finance.
Source: Computed from SARB historical series.

Unemployment: Productivity

Productivity is a prerequisite for international competitiveness and economic growth and development. Labour productivity is the most common measure of productivity, largely because labour costs constitute the largest share in the value of most products (in South Africa wages and salaries represent more than 50% of the cost of producing GDP). Capital productivity measures the output per unit of capital employed (fixed capital, inventions and land resources). Total factor productivity (TFP) measures the efficiency of all inputs to a production process; i.e., it not only labour or capital. Its level is therefore determined by how efficiently and intensely inputs are utilized in production. It plays a critical role in explaining economic fluctuations, economic growth and cross-country differences in per capita income. Factors contributing to TFP growth include innovation, the availability of skilled labour, the cost of conducting R&D, the availability of technology (and the efficiency with which technology is used), and the availability and ability of management to harmoniously and efficiently blend the available inputs.

Figure 7 shows that the productivity of labour in the non-agricultural sectors of the South African economy drifted downwards during the 1970s and 1980s; by 1992 productivity was 16% lower than in 1970. Labour productivity then increased at an average annual rate of 3% until 2003. The annual increase since 2011 has been a more sedate 1.2%. Consequently, labour productivity in 2014 was no higher than in 1996.

Between 2000 and 2017 real remuneration growth per worker in the public non-agricultural sector of the economy averaged 1.8% per annum. The corresponding figure in the private sector was 1.6%, while the average for the entire non-agricultural sector was 1.7% (**see Figure 8**). Generally, the increases in remuneration have exceeded productivity growth since 2010; consequently, the nominal unit costs of labour rose during this period - in a period during which the economy has suffered a recession, tepid growth and chronically high unemployment. In fact, in 2017 the unit costs of labour were almost two times higher than at the beginning of the 21st century (**see Figure 9**).

South Africa's TFP performance over the last three decades has been disappointing when considered according to its own historical development, as well as when compared with other countries of a similar nature. **Figure 10** shows there were 15 annual declines in the country's TFP between 1990 and 2014. Consequently, the level of TFP in 2014 was 22.6% lower than in 1989. The reasons for South Africa's sluggish TFP performance can be attributed to, *inter alia*, low efficiencies in the use of labour and capital; a variety of challenges (including regulatory and financial barriers) that prevent businesses from maximizing their potential; and a low competitive base.

In the light of South Africa's comparatively disappointing productivity record over the last three decades, and the indisputable need to achieve higher economic growth, it is clear that broad-based, well-integrated development strategies are required in order to raise productivity and, therefore international competitiveness. If the manufacturing sector is to become a major job creator (this is a major thrust of the National Growth Plan), it clearly needs to become more internationally competitive. The latter is *inter alia* a function of the unit costs of labour. In order to bring the latter into line with international standards, some combination of the following needs to happen: (1) Substantially higher productivity per worker; and/or (2) far more moderate annual wage increases. Regarding the first - while all kinds of education are important in enhancing productivity growth, the need for vocational training and advanced technical education rises with the level of technical sophistication of an industry. Improved productivity, and therefore growth and prosperity require a rapid improvement in the education and training of South Africa's current and future workforce.

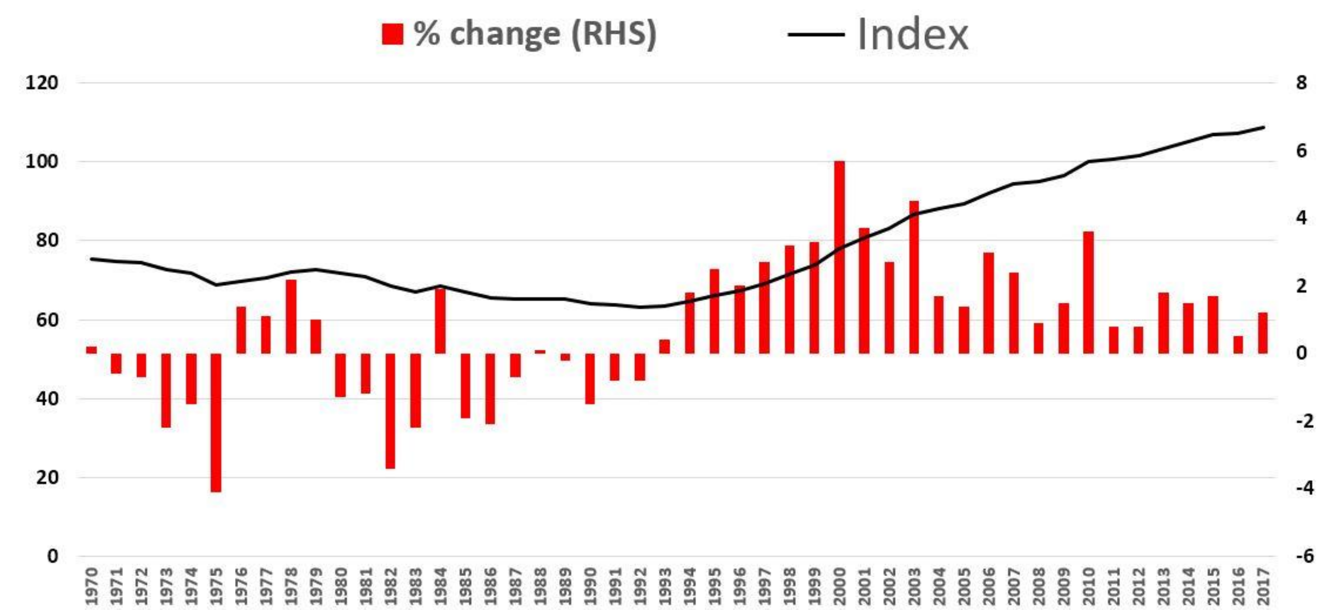

Figure 7: Labour productivity in the non-agricultural sectors, 1970-2017
Source: Computed from SARB historical series.

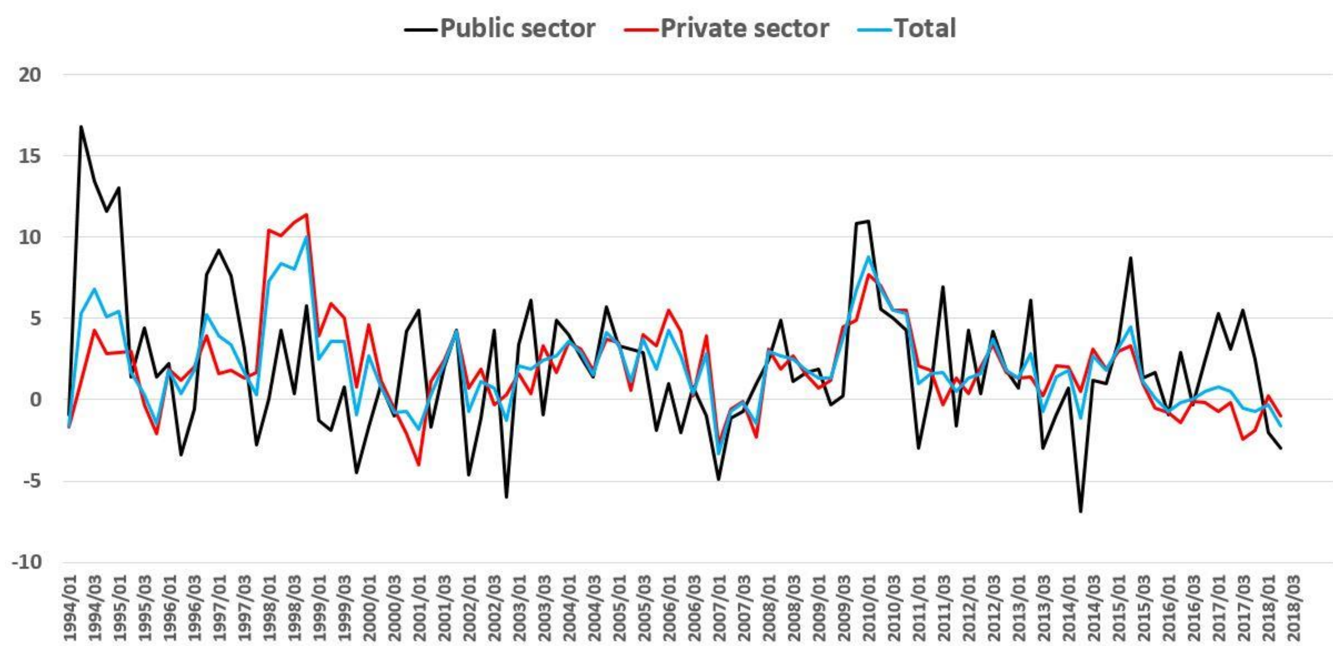

Figure 8: Real remuneration per worker in the non-agricultural sector; year-on-year percentage change, 1970-2017
Source: Computed from SARB historical series.

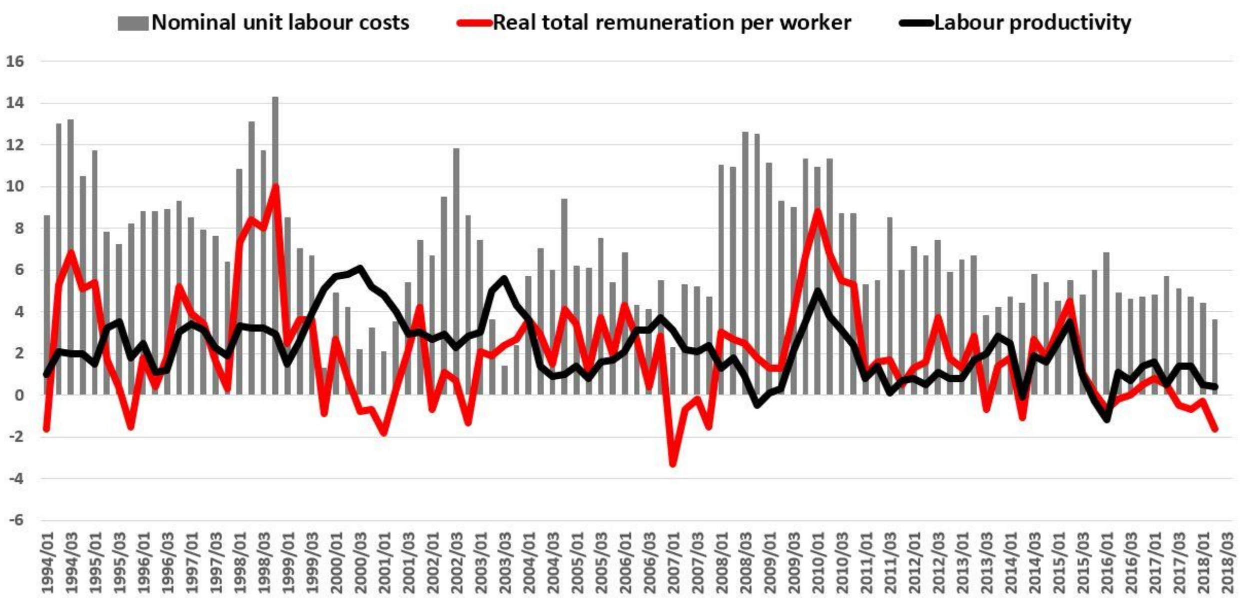

Figure 9: Real total remuneration per worker, labour productivity, and nominal unit labour costs in the non-agricultural sectors; year-on-year percentage change
Source: Computed from SARB historical series.

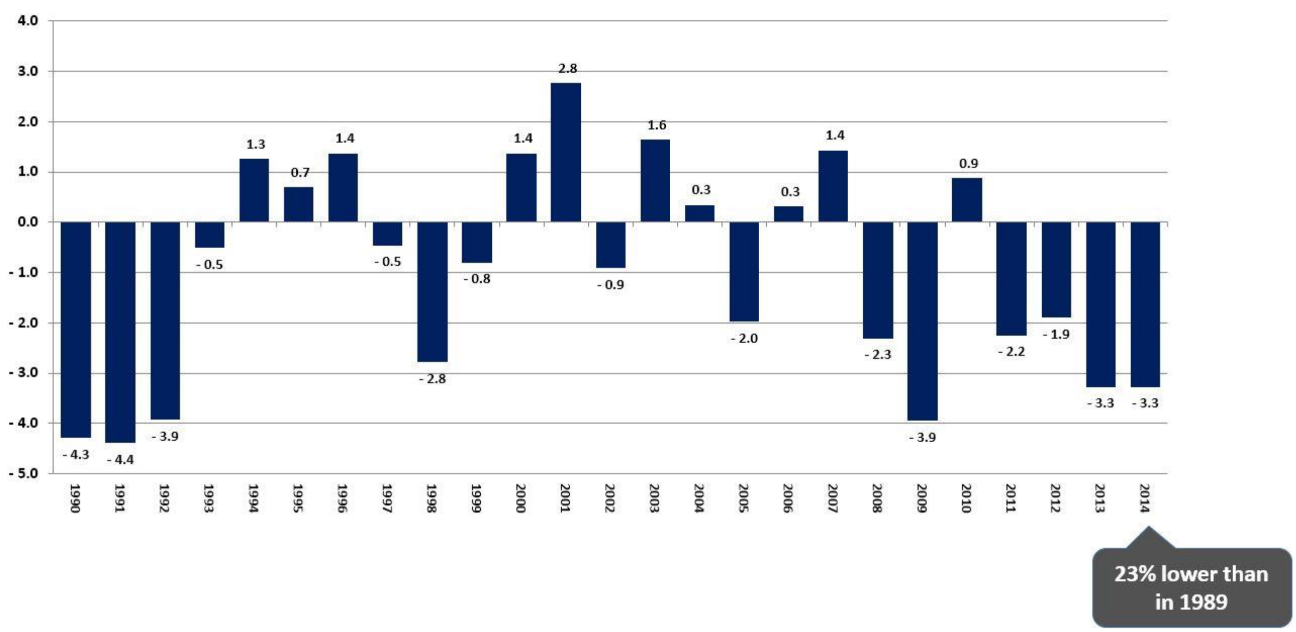

Figure 10: Total factor productivity growth in South Africa, 1980-2014
Source: Computed from The Conference Board Total Economy Database; Adjasi, 2015

Unemployment and the quality of labour

The availability of a strong and appropriate skills base is a crucial element of any strategy to reduce unemployment and to enhance and sustain economic growth, development and poverty alleviation. To this end efficient and appropriate education and training contribute toward finding a better match between the availability of skills and the requirements of the labour market.

As pointed out earlier, by September 2018 employment had risen to 16.4m. Between 2001 and 2015, growth amongst persons working in more skilled occupations was higher than amongst those in less skilled occupations. However, less than a quarter of the employed in September 2018 were recorded as working in more skilled occupations (as managers, professionals/semi-professionals, and technicians), while just less than a quarter of the employed were classified as elementary workers (**Table 8**).

Labour force participation in South Africa is also segmented by occupation and population group. A significantly larger proportion of unskilled workers are found among the black African and coloured population groups. This means that the skills requirements in the market are not being met by the millions of people available for work. Various initiatives embodied in labour legislation are intended to rectify these imbalances in the longer term, but will not bring about substantial immediate change. The skills shortfall is further compromised by the fact that highly-skilled workers are highly mobile, able to emigrate in favour of higher earnings and/or better job and personal security in other countries.

Some 56% of unemployed South Africans have fewer than 12 years of formal schooling (**Table 10**). By contrast, approximately 54% of those employed have at least 12 years of formal education (**Table 9**). These relationships match conventional wisdom. However, counter-intuitively, just over 40% of the unemployed have 12 or more years of education. This suggests an oversupply of young people with an inappropriate education – an extremely serious problem for South Africa, no matter how its future develops. It results in many young people entering the labour market with

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only a slim hope of finding productive and permanent employment. This is a serious threat to stability and may even fuel an anti-government disposition.

This state of affairs is obviously inappropriate for an economy that displays a structural composition similar to that of a developed nation. A modern economy is primarily dependent on its managerial and professional classes for continued innovation, long-term competitiveness, sustained economic growth and development. The structural imbalance in South Africa's economically active population (shortage of skilled labour; surplus of unskilled and semi-skilled labour) not only entrenches structural unemployment; it also compromises economic growth and, ultimately, development.

Table 8: Employment by occupation, March 2001- September 2018

Occupation	**Mar 2001**	**Mar 2003**	**Mar 2005**	**Mar 2009**	**Mar 2010**	**Mar 2011**	**Mar 2013**	**Sep 2018**
More skilled occupations[1)]	20.1	21.0	20.5	24.5	24.6	25.5	25.6	23.1
Less skilled occupations	79.9	79.0	79.5	75.5	75.4	74.5	74.4	76.9
⬩ clerks	9.6	10.6	10.6	10.3	11.3	10.2	10.5	10.3
⬩ sales & services	14.4	11.7	12.7	13.1	14.1	14.5	14.3	16.2
⬩ skilled agriculture	1.7	0.8	0.8	0.9	0.7	0.6	0.5	0.4
⬩ craft & related trade	13.9	13.5	14.8	13.3	12.3	12.4	11.5	12.3
⬩ plant & machine operators	8.9	9.6	8.9	8.9	8.2	8.6	9.0	8.4
⬩ elementary	24.3	24.5	24.1	21.5	21.9	21.5	22.1	23.3
⬩ domestic workers	7.6	8.3	7.2	7.6	6.9	6.7	6.4	6.0
Total (thousand)	**12 494**	**11 666**	**12 503**	**13 636**	**12 803**	**13 118**	**13 621**	**16 380**

Note: **1)** Comprised of managers, professionals/semi-professionals, and technicians.
Sources: StatsSA, 2008; 2009; 2010; 2011; 2013; 2015; 2018.

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Table 9: Highest level of education of the employed in September 2018		
Education level	**‘000**	**% of total**
No schooling	286	1.7
Less than primary completed	987	6.0
Primary completed	626	3.8
Secondary not completed	5 572	34.0
Secondary completed	5 245	32.0
Tertiary	3 478	21.2
Other	187	1.1
Total employed	**16 380**	**100.0**

Sources: Compiled from StatsSA, 2018.

Table 10: Highest level of education of the unemployed in September 2018		
Education level	**‘000**	**% of total**
No schooling	77	1.2
Less than primary completed	319	5.1
Primary completed	231	3.7
Secondary not completed	2 863	46.1
Secondary completed	2 181	35.1
Tertiary	504	8.1
Other	34	0.5
Total employed	**6 209**	**100.0**

Sources: Compiled from StatsSA, 2018.

Unemployment: Future prospects?

It is often argued that inflexible labour market conditions and minimum wages are co-producers of South Africa’s consistently high level of unemployment, as ‘labour prices itself out of the market.’ Indeed, expressed in PPP US$ terms, the minimum wage in South Africa is significantly higher than in any other member of BRICS, where unemployment, by contrast, is significantly lower than in South Africa (**Table 11**).

Table 11: Growth in real monthly wage and minimum wage in PPP US$, selected countries, 2006-2009

Country	2006	2007	2008	2009	Minimum wage in PPP US$ (2009 or latest available)	Unemployment rate (2006-2009)
Australia	0.1	3.2	1.8	-1.8	1 597	5.6
France	1.1	0.4	0.0	1.2	1 443	9.1
Japan	0.4	2.1	0.9	2.8	944	5.0
Spain	1.8	2.6	1.0	4.3	911	18.0
UK	3.6	0.8	0.2	-0.9	1 507	7.7
USA	3.1	10.4	7.9	11.0	1 257	9.3
Botswana	-3.1	-1.0	-5.0	-7.5	159	17.6
South Africa	**0.9**	**-1.1**	**-2.3**	**4.7**	**390**	**23.8**
Brazil	12.0	4.8	3.3	6.8	223	8.3
China	12.9	4.7	-	-	173	4.3
India	-5.8	6.0	11.9	-	121	-
Russian Fed	25.4	91.8	14.3	10.5	223	8.2

Sources: ILO, 2010; World Bank, 2011.

An IMF working paper (2011) explores the extent to which the severe job losses in South Africa in 2009-2010 can be attributed to real wage developments. One of the major findings was that excess real wage growth (the gap between real wage growth and labour productivity growth) led to a 'negative and significant impact on overall and formal employment' (IMF, 2011:5). Rough and ready calculations indicate that excess real wage growth accounted for at least 25% of job losses between 2008 and 2010. There is also some evidence that the impact on informal employment was positive, as higher excess real wage growth generates a substitution between formal and informal workers. An additional finding was that, whereas internationally real wage growth is positively correlated with labour productivity, in South Africa the link is significantly weaker. This, in turn, suggests that in South Africa, real wage growth is largely driven by factors not linked to labour market factors.

Wage flexibility may, however, come at a price, which is of relevance to South Africa. If countries respond to competition by allowing greater wage flexibility, wage differentials will increase with a resultant increase in inequity. If they respond by protecting the wages of unskilled labour, unemployment is likely to rise. This creates a real tension and a prioritisation of society's values and the need to make tough choices. Part of the solution could be a wage subsidy aimed at younger workers. Current labour market institutions do not allow for the productivity gap between young and older workers to be reflected fully in wage differentials and so unemployment among young labour force entrants is exceptionally high at almost 50%. A wage subsidy would make it cheaper for firms to employ young unskilled workers, helping to build skills and enhance the productivity of these workers over their careers.

The fact is that an understanding of South Africa's labour market configuration defies orthodox analysis. Outcomes, such as employment growth, are often not determined by simple demand-supply dynamics. Moreover, compared to other emerging economies during the first nine years of the 21st century, South Africa has often failed to achieve the basic macro-economic conditions required to record fast employment growth. In this regard, policies should pay particularly close attention to inflation pressure. It is also apparent that public sector employment growth does not lead to sustained job creation. High average and minimum wages (especially relative to output) are linked to slow job growth. Here, South Africa's high wage structure could be decisive in explaining a significant part of slow job growth. Coupled to this is the evidence that the large gap between real wage growth and labour productivity growth has compromised employment.

The underlying message is that, as long as unwarranted rigidities exist in the labour market and the macro-economic environment is not improved, the rate of growth in job creation will fail to match the growth rate of the economically active population. This implies pervasive and structurally high levels of unemployment.

Trade unions have a vital function in respect of issues pertaining to business ethics. It is the moral duty and obligation of trade unions to take an active interest in issues of corporate governance, particularly in respect of levels of executive remuneration and accountability. It is, after all, the workers, together with shareholders, that suffer most from bad ethical practices.

Perhaps labour's most serious shortcoming is the absence of a clear long-term strategy. Labour can no longer rely on opposition politics, the ANC alliance or legislative change in order to define its goals and future role. In the light of the Labour Relations Act and other associated labour legislation, worker participation at all levels of society, and international acceptance, it is up to labour to determine its role in the workplace and society at large, and to take up modern-day challenges of decentralisation and internationalisation. Labour in general stands between marginalisation and revitalisation.

INTERVIEWS, INDUSTRY ANALYSES AND SCENARIOS

This part of the report captures the results of interviews with industry stakeholders, industry analyses that incorporate drivers of change for 12 industries as well as jobs that are at risk or could emerge as a result of the drivers of change, and a scenario generation process.

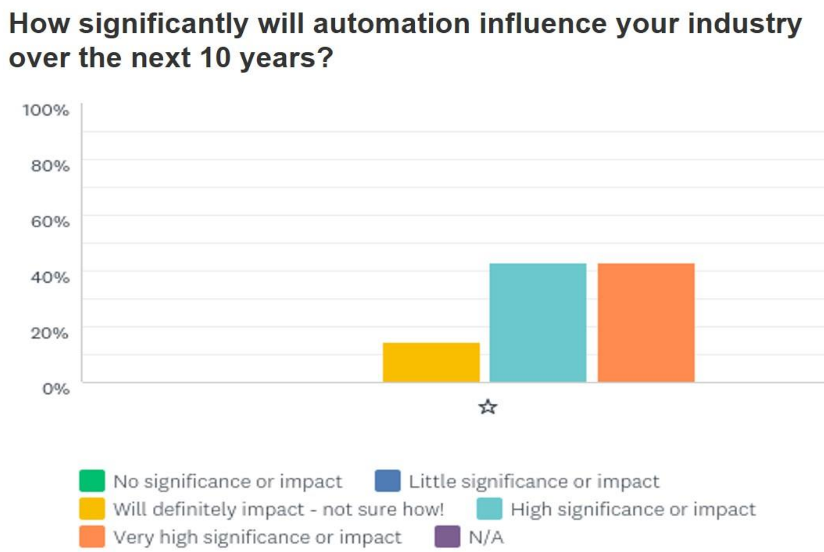
The main aim of these activities was gaining insight into what could happen in future. Practicing foresight is never about predicting, it is rather about exploring different plausible outcomes, imagining different versions of the future operating environment in South Africa. These insights could enable decision makers to recognise and plan timeous responses to emerging threats as well as opportunities.

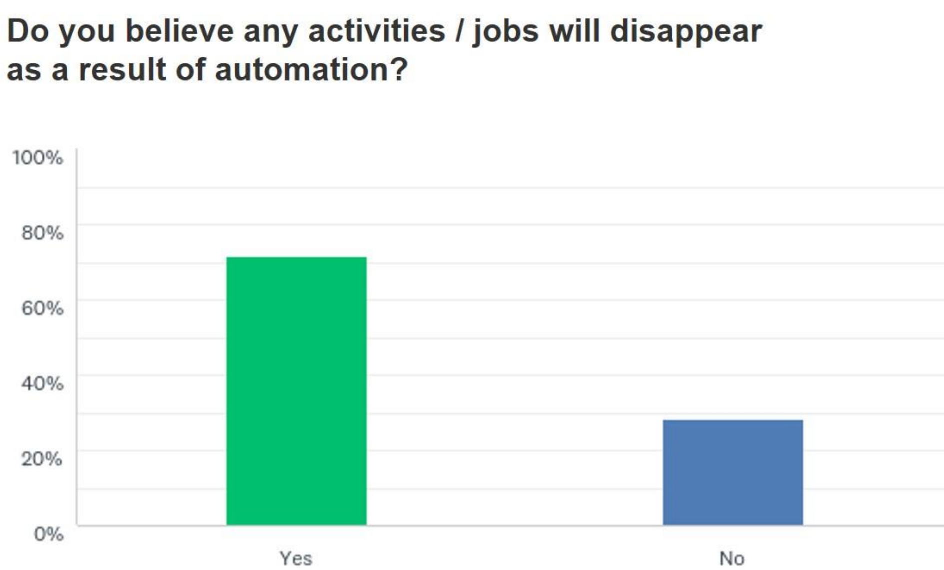
INSIGHTS GAINED FROM INTERVIEWS

The NEDLAC Research Reference Group provided names of people that could be interviewed by the IFR. Interview questions focused on the perceived influence of automation, globalisation and demographic changes on South African industries. The graphs below portray the responses of the participants. The insights gained from the interviews were incorporated by the IFR research team into the industry analysis as well as the scenario generation process.

Overall, respondents were of the opinion that automation, globalisation and demographic change could have a significant impact on their industries, causing some jobs and activities to disappear, while creating opportunities for new jobs and activities to emerge.

THE INFLUENCE OF AUTOMATION





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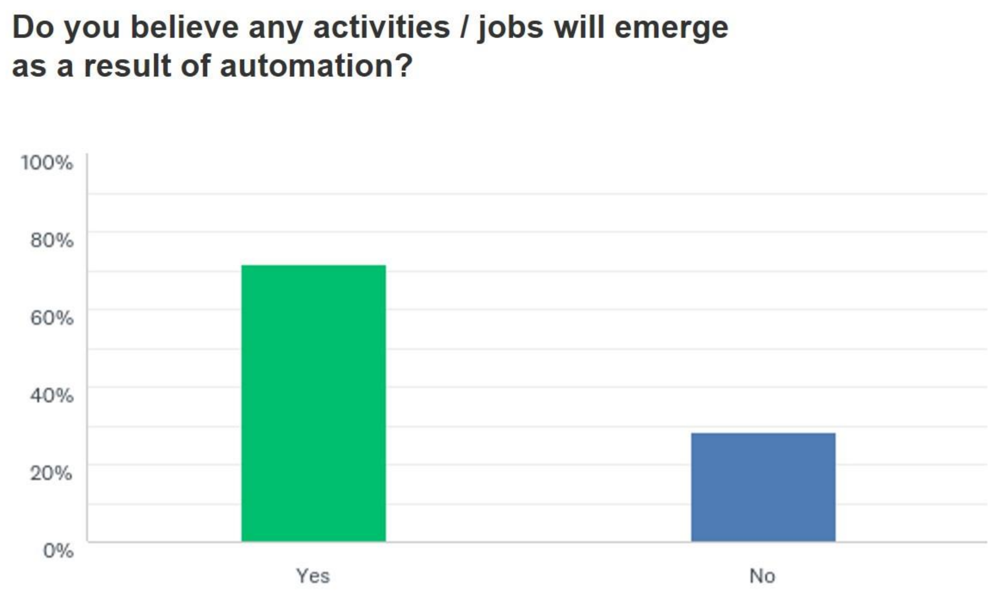
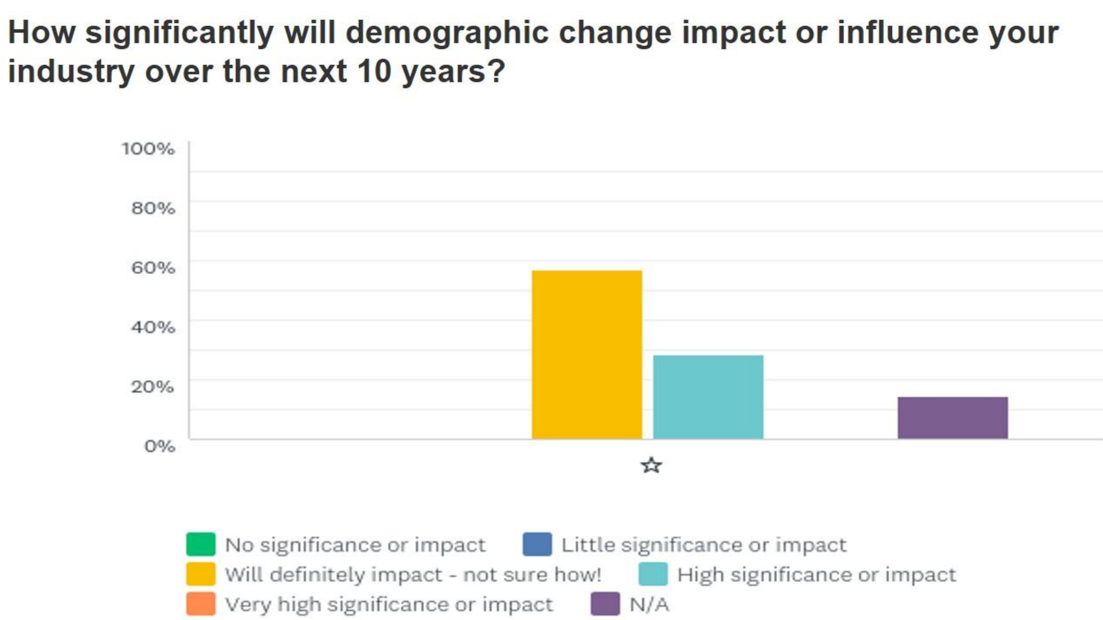


THE INFLUENCE OF DEMOGRAPHIC CHANGES



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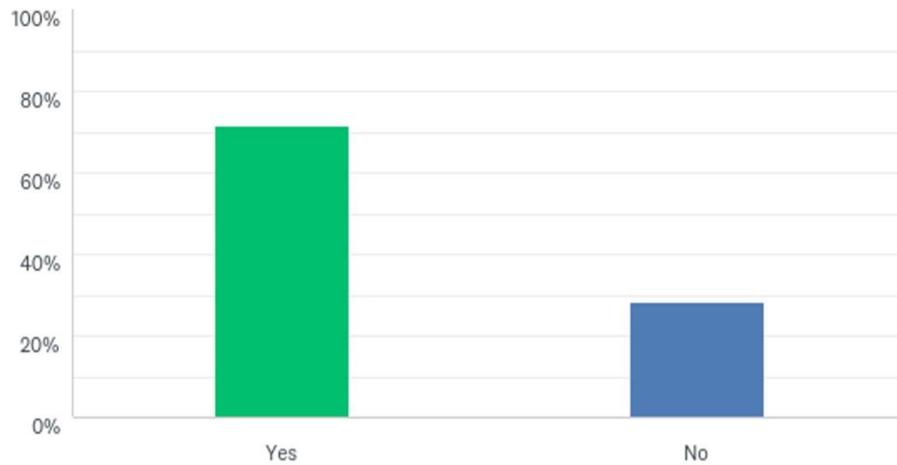
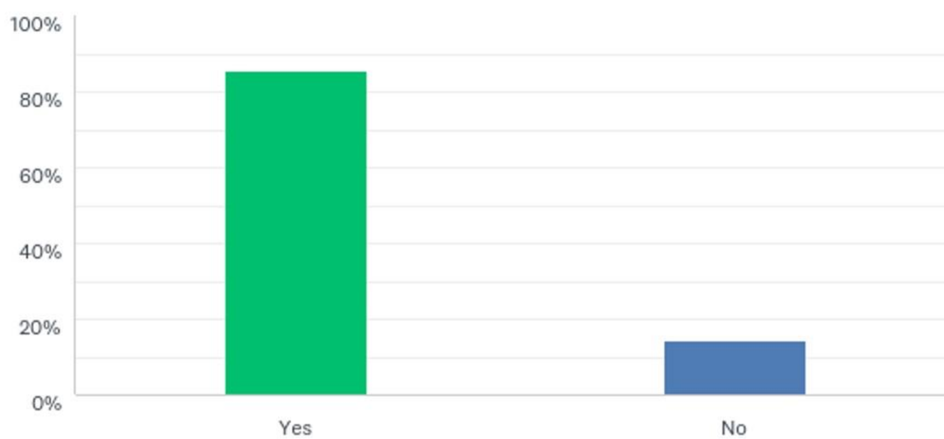
Do you believe any activities / jobs will disappear as a result of demographic change?



Do you believe any activities / jobs will emerge as a result of demographic change?



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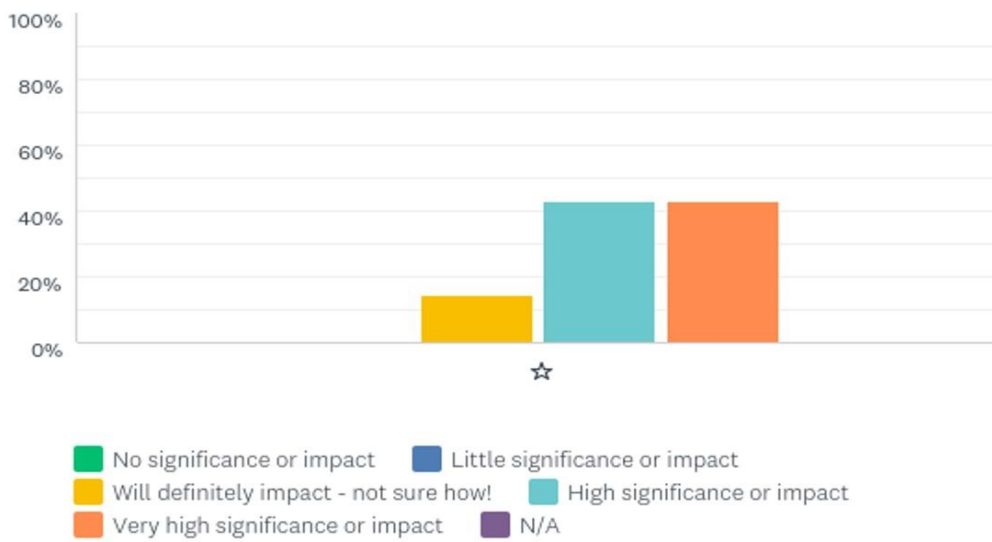
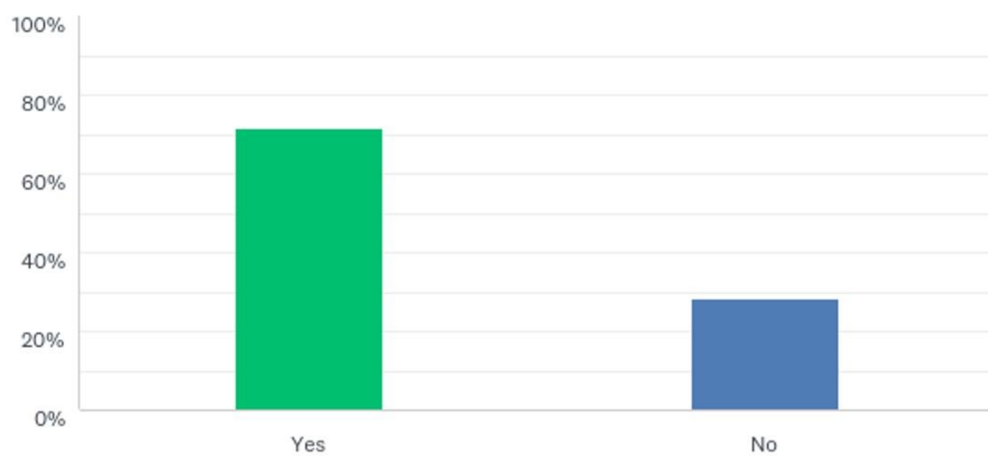
THE INFLUENCE OF GLOBALISATION

How significantly will globalization influence your industry over the next 10 years?



Do you believe any activities / jobs will disappear as a result of globalisation?



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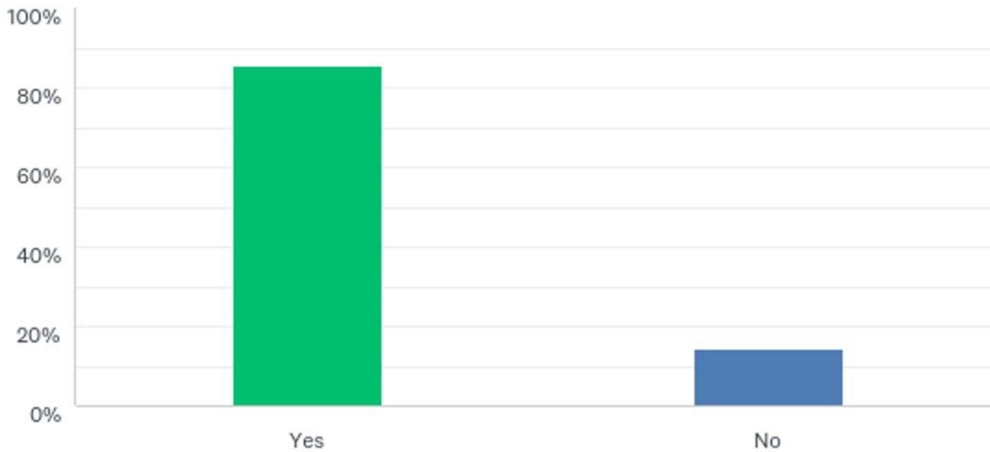
Do you believe that new activities or jobs will emerge as a result of globalisation?



DRIVERS OF CHANGE ON INDUSTRY LEVEL

Read this with PART A: INDUSTRIES AND ECONOMIC ACTIVITIES IN SOUTH AFRICA AFFECTED BY THE 4IR

A global perspective

The emerging contours of the new world of work in the wake of the Fourth Industrial Revolution are rapidly becoming a lived reality for millions of workers and companies around the world. The inherent promise of opportunities for economic prosperity, societal progress and individual flourishing in this new world of work are enormous, yet depend crucially on the ability of all concerned stakeholders to instigate reform in education and training systems, labour market policies, business approaches to developing skills, employment arrangements and existing social contracts.

The potential of new technologies needs to be understood - including cognitive automation, intelligent algorithms, autonomous vehicles, quantum computing and smart, connected products / systems. They have the potential to create new high-quality jobs, and to vastly improve job quality and the productivity of human employees. As has been the case throughout economic history, augmentation of existing jobs through technology is expected to create wholly new roles and tasks—from specialist data scientists to application (app) development to piloting drones to remotely monitoring patient health to certified care workers—all opening up opportunities for an entirely new range of livelihoods.

The speed and depth of technology adoption drives business growth, new job creation and the need for augmentation of existing jobs, provided it can fully leverage the talents of a motivated and agile workforce that is equipped with skills to take advantage of new opportunities. This can only be achieved through proactive retraining and upskilling. Conversely, skills gaps - both among workers and among an organisation's senior leadership—may significantly hamper new technology adoption and therefore business growth.

Table 12: Trends set to influence business growth

Trends set to positively influence business growth towards 2022	Trends set to negatively influence business growth towards 2022
Increasing adoption of new technology	Increasing protectionism
Increasing availability of big data	Increase in cyber threats
Advances in mobile internet	Shifts in government policy
Advances in artificial intelligence	Effects of climate change
Advances in cloud technology	Increasingly older societies
Shifts in national economic growth	Shifts in legislation on talent migration
Expansion of affluence in developing economies	Shifts in national economic growth
Expansion of education	Shifts in the mindset of the new generation
Advances in new energy supplies and technologies	Shifts in global macroeconomic growth
Expansion of the middle classes	Advances in artificial intelligence

Source: Future of Jobs Survey 2018, World Economic Forum

New roles, stable roles and redundant roles

The World Economic Forum's Future of Jobs Survey suggested new roles, roles that could become redundant, and those that could remain stable in the near future.

The roles that the WEF regard as stable, are:

- Managing directors and chief executives
- General and operations managers (some industries)
- Software and applications developers and analysts (some industries)
- Data analysts and scientists (some industries)
- Sales and marketing professionals (some industries)
- Sales representatives: wholesale and manufacturing, technical and scientific products
- Human resource specialists
- Financial and investment advisers
- Database and network specialists
- Supply chain and logistics specialists
- Risk management specialists

- Information security analysts
- Management and organization analysts
- Electrotechnology engineers
- Organisational development specialists
- Chemical processing plant operators
- University and higher education teachers
- Compliance officers
- Energy and petroleum engineers
- Robotics specialists and engineers
- Petroleum and natural gas refining plant operators

The roles that the WEF foresee as growing, are:

- Data analysts and scientists (in some industries)
- AI and machine learning specialists
- General and operations managers (in some industries)
- Big data specialists
- Digital transformation specialists
- Sales and marketing professionals (in some industries)
- New technology specialists
- Organisational development specialists (in some industries)
- Software and applications developers and analysts (in some industries)
- Information technology services
- Process automation specialists
- Innovation professionals
- Information security analysts (in some industries)
- E-commerce and social media specialists
- User experience and human-machine interaction designers
- Training and development specialists

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- Robotics specialists and engineers
- People and culture specialists
- Client information and customer service workers (in some industries)
- Service and solutions designers
- Digital marketing and strategy specialists

The roles that the WEF Survey regard as becoming redundant, are:

- Data entry clerks
- Accounting, bookkeeping and payroll clerks
- Assembly and factory workers
- Administrative secretaries
- Client information and customer service workers (in some industries)
- Accountants
- Material-recording and stock-keeping clerks
- General and operations managers (in some industries)
- Postal service clerks
- Financial analysts
- Cashiers and ticket clerks
- Telemarketers
- Bank tellers and related clerks
- Car, van and motorcycle drivers
- Sales and purchasing agents and brokers
- Door-to-door sales workers
- News vendors
- Statistical, finance and insurance clerks
- Legal clerks

Among the range of established roles that are set to experience increasing demand in the period up to 2022 are Data Analysts and Scientists, Software and Applications Developers, E-commerce and Social Media Specialists – all roles that are significantly based on, and enhanced by, the use of technology and the digital fluency of people.

Also expected to grow are roles that leverage distinctively 'human' skills, such as Customer Service Workers, Sales and Marketing Professionals, Learning Specialists, People and Culture Specialists, and Organizational Development Specialists as well as Innovation Managers. There could be an accelerating demand for a variety of wholly new specialist roles related to understanding and leveraging the latest emerging technologies: AI and Machine Learning Specialists, Big Data Specialists, Process Automation Experts, Information Security Analysts, User Experience and Human-Machine Interaction Designers, Robotics Engineers, and Blockchain Specialists.

A view on global industries

The future of jobs is not all linear and will not evolve in the same manner in different industries. It could differ by industry and sector, influenced by initial starting conditions around the distribution of tasks, different investments in technology adoption, and the skills availability and adaptability of the workforce. As a consequence, different industries could experience variations in the composition of emerging roles as well as in the nature of roles for which there are declining demand.

Among the trends driving growth across industries over the 2018–2022 period, advances in mobile internet are likely to have a distinct impact in the Aviation, Travel & Tourism industry, the Financial Services & Investors industries, and in the Consumer industry. The rapid adoption of new technologies by consumers as well as advancements in connected devices and in cloud technology are set to drive growth in the Information & Communication Technologies industry. The availability of big data is expected to have an even broader influence on the Financial Services and the Energy Utilities & Technologies industries. New energy supplies and technologies, in tandem with advances in computing power, are set to drive gains in the Energy Utilities & Technologies sector. Among the non-technological drivers of business growth are

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increasing affluence in developing economies. This is poised to drive growth in the Aviation, Travel &Tourism; Global Health & Healthcare; and Chemistry, Advanced Materials & Biotechnology industries.

Figure 10 illustrates how these trends could influence organisations towards 2022.

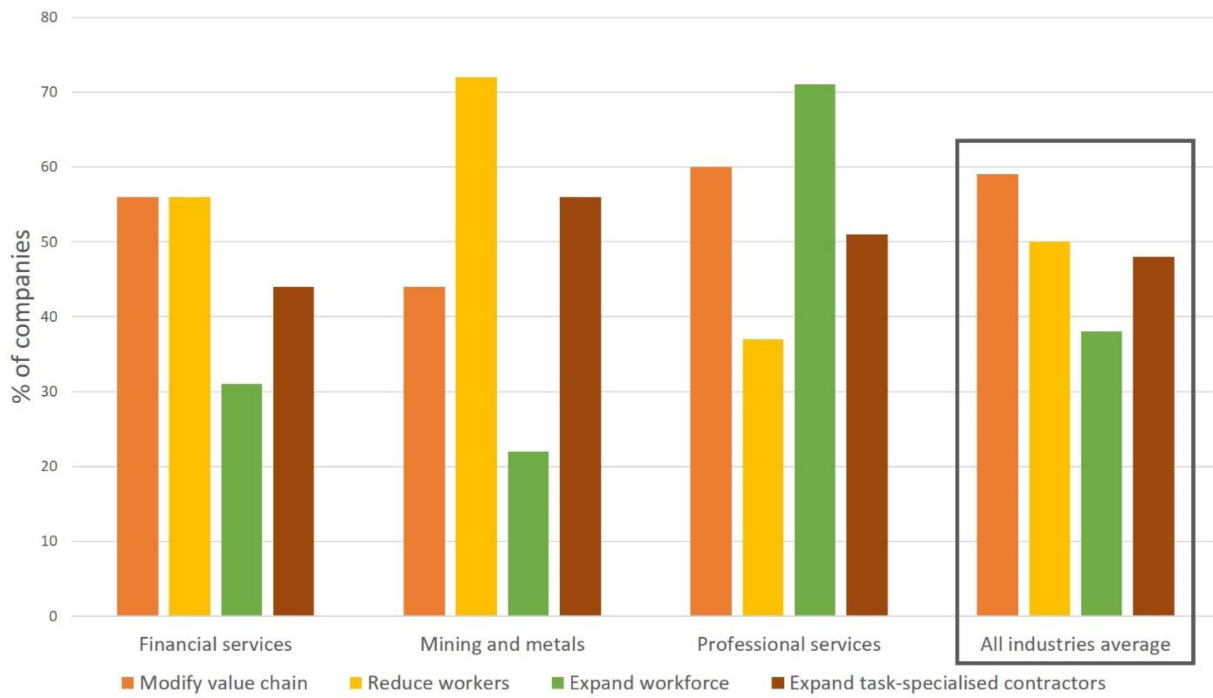

Figure 10: Influence of global trends on selected industries

Source: WEF Future of Jobs Survey, 2018

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ANALYSIS OF SELECTED INDUSTRIES

The NEDLAC research reference group requested the IFR to highlight emerging trends in 12 industries namely healthcare, the informal sector, energy, transport, the public sector, services, education, agri-processing, financial services, mining, manufacturing and agriculture. The analysis captured here is the result of insights gained from desktop research, a workshop with the IFR research colloquium and the interviews conducted as part of this project. The overviews capture trends of a generic and international nature applied to South African industries.

HEALTHCARE

Trends driving industry change

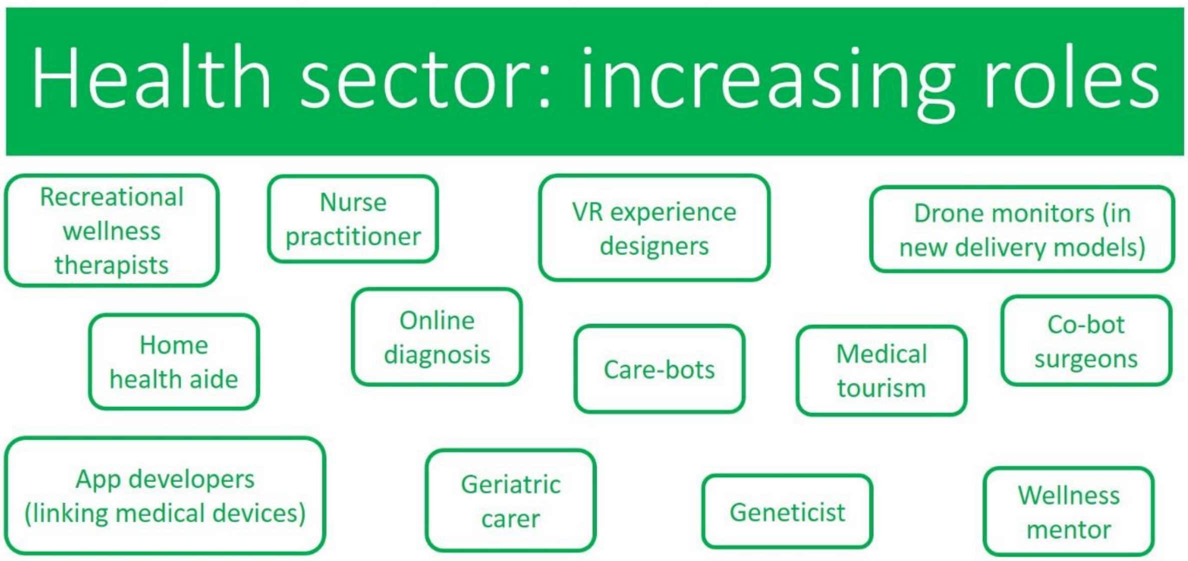
Aging populations, the rise of **non-communicable diseases** and the emergence of **intelligent, connected 'wearables'** are driving an industry shift away from curing disease in the short term toward preventing / managing disease and promoting overall **well-being (wellness)** in the long term. Life expectancy is projected to increase from 73.5 years in 2018 to 74.4 in 2022 - bringing the number of people aged over 65 globally to more than 668 million, or 11.6% of the total global population. (Deloitte, 2019 Global health care outlook, Shaping the future)

A future is envisioned where new **business and care delivery models**, aided by **digital technologies**, may help to address today's problems and may build a sustainable foundation for affordable, accessible, high quality health care for all.

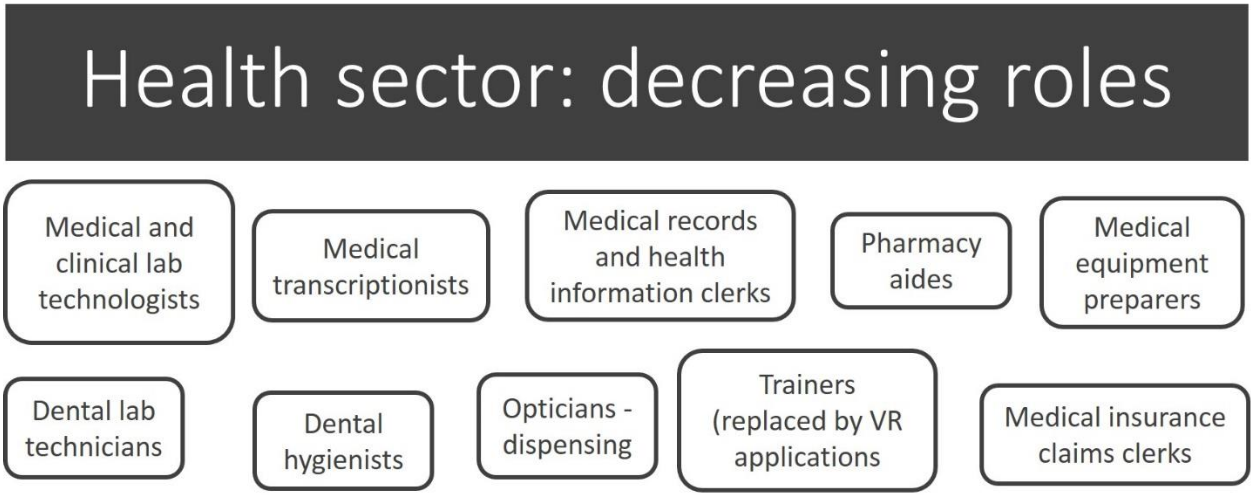
Standing at the epicentre of the new health care value system will likely be **informed and empowered consumers** - change agents and active caretakers of their health who have high expectations of their health care ecosystem. These consumers will likely be "pulling" solutions rather than being "pushed" services, flipping the current health care delivery model from business-to-consumer (B2C) to consumer-to-business (C2B). In response, stakeholders are expected to use innovative technologies and personalised programs to engage with consumers and improve the patient experience. **Data interoperability, security, and ownership** should move to the forefront as consumers join other stakeholders in accessing, analysing, and sharing information. In addition, disruptive trends in health care delivery and mobility may radically alter everything from the site of care to who delivers care and how.

Health care is a people business, and quality of care depends greatly on having the right professionals with the right skills in the right place at the right time. However, an **aging workforce**, **rising demand for health care services** and **reduction in physician working hours** are driving shortages of appropriately skilled people in both developed countries (e.g., urban versus rural areas, specialists in some fields) and developing economies (global mobility).

Roles and activities expected to increase



Roles and activities expected to decrease



THE INFORMAL ECONOMY

The informal economy comprises more than half of the global labour force and more than 90% of Micro and Small Enterprises (MSEs) worldwide. Informality is an important characteristic of labour markets in the world with millions of economic units operating and many millions of workers pursuing their livelihoods in conditions of informality.

The ILO defines the informal economy as – 'All economic activities by workers or economic units that are – in law or practice – not covered or sufficiently covered by formal arrangements.'

The bulk of people operating in the informal economy do so as own account operators or contributing family members. Due to its informal nature, the people operating in this economy do not really have organised representation on national forums, especially when the futures of work are discussed.

Trends driving change

The **rise of collectives and cooperatives**. Across industries, there is a (re)emergence of cooperative societies and collectives, giving a voice and bargaining power to informal operators.

Supermarkets and other retailers creating **offers to service consumers at the lower end of the market** are encroaching on what was the sole domain of spaza shops and informal operators.

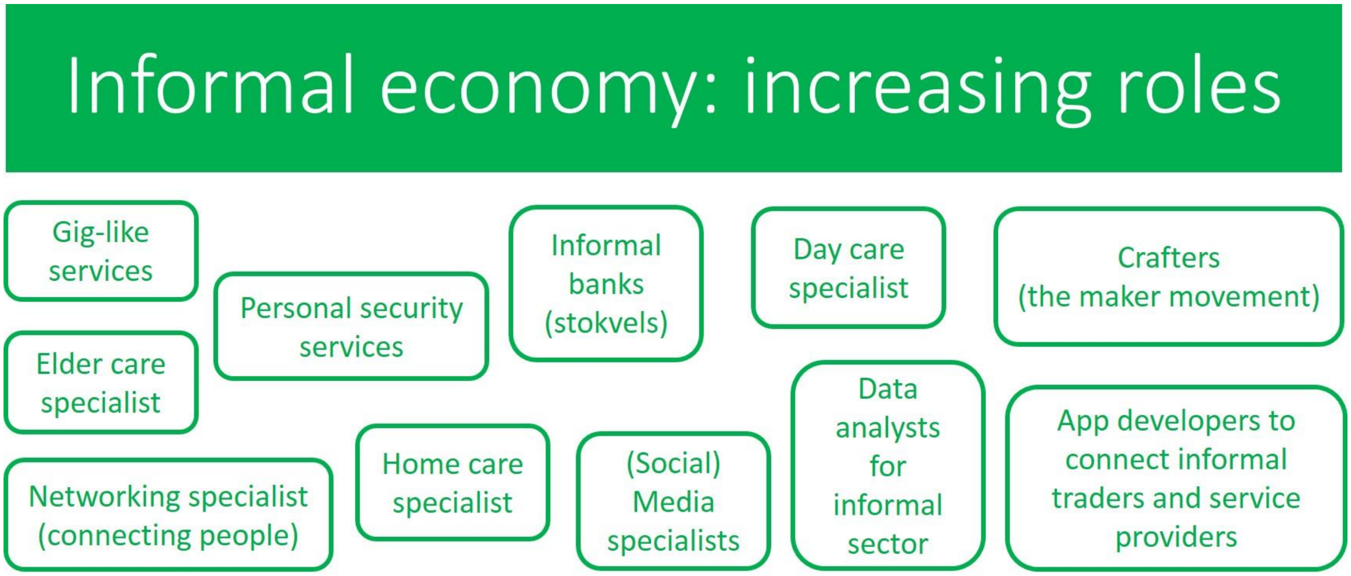
The **growing interest in recycling** should open up opportunities for informal operators to be economically active.

The rise of the **gig economy** creates new processes and breaks down existing physical and mental barriers against working on a gig-like basis.

The rise of **digital platforms**, coupled with increased **digital proficiency** and enhanced **connectivity**, will increasingly make it easier for own account operators and their potential customers to find each other.

Changing mental models will continue to 'de-stigmatise' the notion of not having a full-time job.

Roles and activities expected to increase



THE ENERGY SECTOR: OIL AND COAL

The macro trends driving change in the oil and coal industry do not occur in isolation from one another. Whilst technological change is a primary driver, pressure to control climate change by limiting CO2 emissions will push us toward reducing single-car use, and business model, demographic and values changes could be the major driver of changes in mobility usage.

Urbanisation as well as an increased consumer focus on environmentally friendly and healthy lifestyles could encourage cycling, walking and car sharing as alternative forms of mobility.

Trends driving industry change

Legislation and regulation around carbon emissions is increasingly discouraging the usage of fossil fuels. There has been a 20-fold increase in the number of global climate change laws since 1997, according to the most comprehensive database of relevant policy and legislation.

Technology innovation. The Fourth Industrial Revolution is starting to transform technologies, solutions and business models in most sectors, and has the potential to radically change the way people consume products and services. The integrated use of the Internet of Things, Artificial Intelligence (cognitive automation) and Robotics has created digital technologies that enable smart grids and energy system efficiency, may be applied directly to energy sustainability challenges and provide new opportunities for breakthrough innovation.

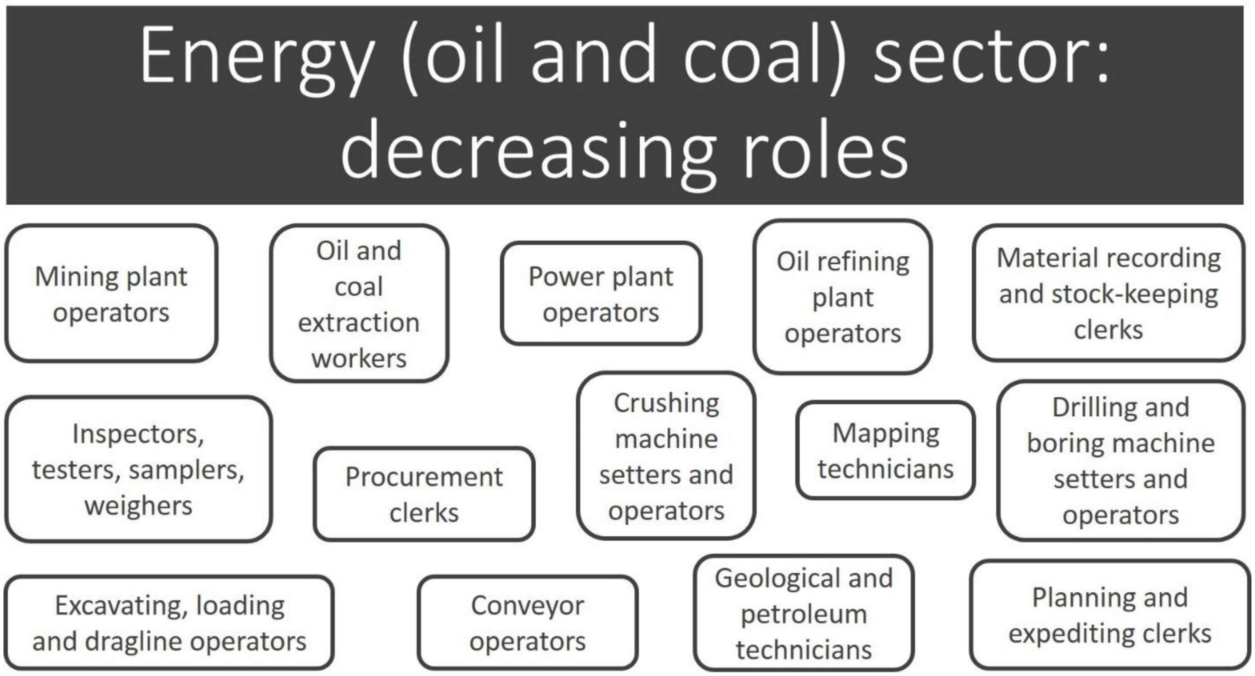
Intelligent cars, changes in engine technology and self-driving cars (autonomous vehicles) are some of the most important technology drivers within the mobility space.

Water, food and climate change. The nexus between natural resource scarcity such as water, food security, and climate change is well established as a key driver of change in today and tomorrow's world. Energy usage is critical to solving the climate change challenge as it directly impacts CO2 emissions, is the backbone powering our economies and modern human activity. Sustainable energy confers multiple benefits for society, including the growth of new industries, reduced impact on the environment and enhanced wellbeing for consumers.

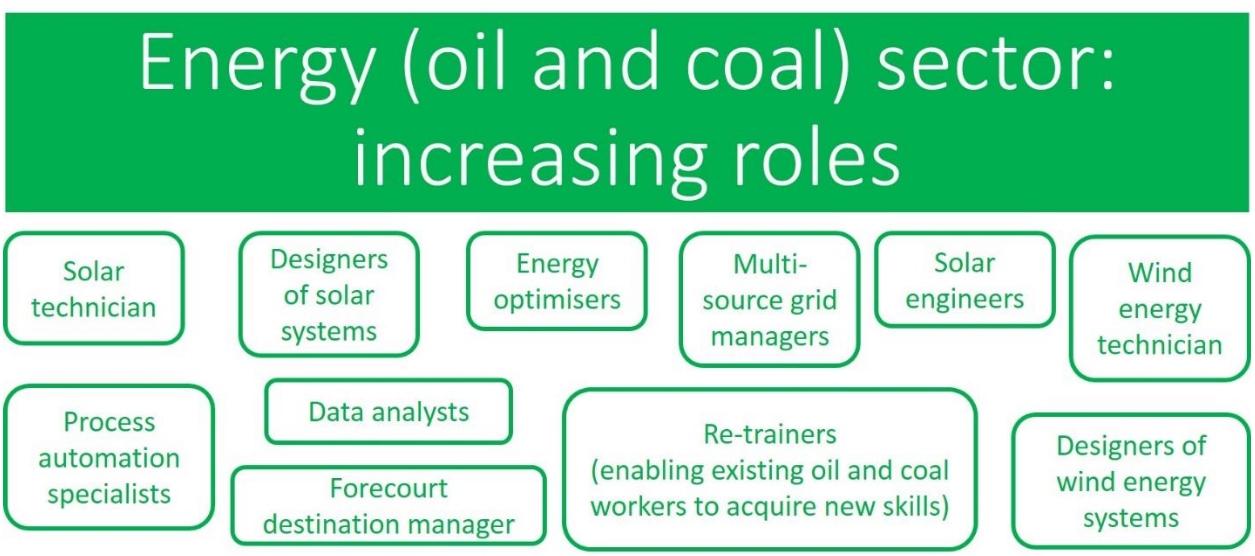
Transportation, industry and households consume energy in the form of electricity or fuel, produced from different renewable and fossil fuel sources and delivered through an array of infrastructures built and operated by many actors. At the same time, the need to tackle the negative environmental effects of the global energy system has never been more pressing.

Globalised, urbanised, connected world. Globalisation is a trend transforming historic patterns of economic trade, financial flows and underlying stocks, creating pressures for rebalancing that are painful for both richer and poorer countries. Trends in birth, death and migration are changing the absolute and relative size of both young and old, rural and urban and ethnic majority and minority populations within emerging and established countries. The net migration of people from rural to urban areas and from poorer to richer countries is likely to continue apace, fuelled by a widening gap in economic and physical security between adjacent regions. If current trends persist, by 2025 about 57% of the world's population could live in urban areas.

Roles and activities expected to decrease



Roles and activities expected to increase



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THE TRANSPORT INDUSTRY

Key trends shaping the future of the global and local transport industry include technology, environmental factors and social aspects. Social trends in particular can play a significant role. These include changes in human behaviour, rising cost of living, aging population, sharing economy and no-ownership mentality, travel patterns and urbanisation. Technologies like hyperloop, drones, UAVs and autonomous vehicles are said to be the biggest potential disruptors for the future of the transport industry.

Trends driving industry change

- Increased adoption of new technologies
- Advances in artificial intelligence
- Increasing availability of big data
- Shifts in national economic growth
- Advances in energy supplies and technologies
- Advances in mobile internet
- Advances in cloud technology
- Expansion of affluence in developing countries
- Expansion of the middle class
- Expansion of education
- Increasing frequency of new working arrangements
- Advances in computing power
- Advances in devices bridging the human-machine divide

The rapid pace of **urbanisation** puts added pressure on already strained infrastructure, which needs to be designed to absorb such growth, and be as efficient as possible. Along with the pressures, come opportunities – the increased size of cities widens their power and tax base and enables a greater investment in public transport.

The following list provides an overview of some of the automation / technology developments that are changing the transportation industry:

Self-driving cars: From 2020 onward, it is expected that self-driving cars will become a more familiar sight on the road while smart cars - cars connected to high-tech networks, but driven by humans – could become the norm.

Autonomous trucks: This technology will influence the future of jobs in transport. Daimler Trucks just launched an 18-wheel, fully autonomous truck to drive on American roadways. Although not completely driverless, it can take over under certain conditions, similar to an auto-pilot on today's aeroplanes, as well as stay at a consistent speed, keep a safe distance from other vehicles and more. Swedish start-up Einride took it a step further with a prototype of a self-driving truck with no cab, which can be completely controlled by a remote operator or drive autonomously without human intervention. Recently, Uber's self-driving truck travelled 120 miles to make its first delivery of 50 000 beers and in the UK self-driving truck platoons are being tested to cut down carbon dioxide emissions and improve efficiency.

Aviation and other things taking flight: Dubai, in collaboration with Volocopter, recently tested a potential drone air taxi. This model was a two-seater flying vehicle without an on-board pilot and it carried Dubai Crown Prince Sheikh Hamdan bin Mohammed on a five-minute flight. The vision is to ultimately be able to call an air taxi like you would an Uber and take to the skies instead of battling traffic. Meanwhile, Amazon is changing up delivery service by piloting Prime Air, using unmanned aerial vehicles to get customers their products in 30 minutes or less. Amazon was also granted a patent to develop a drone that can connect to an electric car in motion to recharge it.

Remote-controlled cargo ships: Rolls-Royce is taking to the high seas and revealed plans to develop cargo ships that can transport goods without needing humans on board. Multiple ships would be controlled by a land-based control hub; since there would be no crew on board, these would be cheaper to operate and have more room for cargo than today's ships. They predict we will see a "remote-controlled ship in commercial use by the end of the decade."

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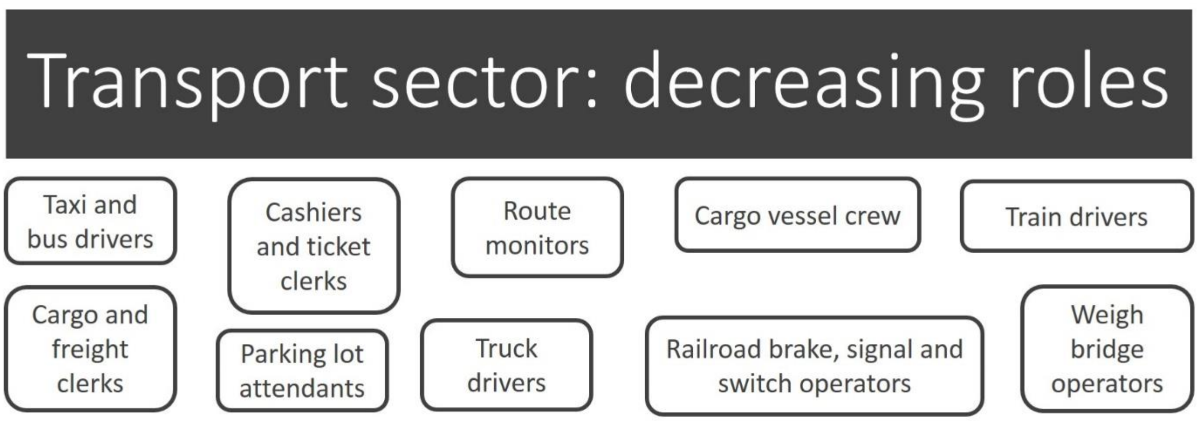
Machine learning leads to optimisation: Whether it's a train, plane or automobile, all of our connected devices yield tremendous amounts of data that we can use to improve safety and efficiencies throughout our transportation system. From tracking traffic and optimising delivery routes, to payment processing and insurance premiums based on real-time data, data is the fuel that will power tremendous insights to enhance the transportation system. (Forbes November 2017. The Future of the Transport Industry - IoT, Big Data, AI and Autonomous Vehicles)

Tremendous strides by innovators have resulted in some fascinating and intriguing enhancements to the transportation industry and these developments could cause transportation companies to rethink job descriptions and figure out when humans should be at the helm or when they should defer to smart machines for safety, cost savings and capabilities.

Roles and activities expected to decrease



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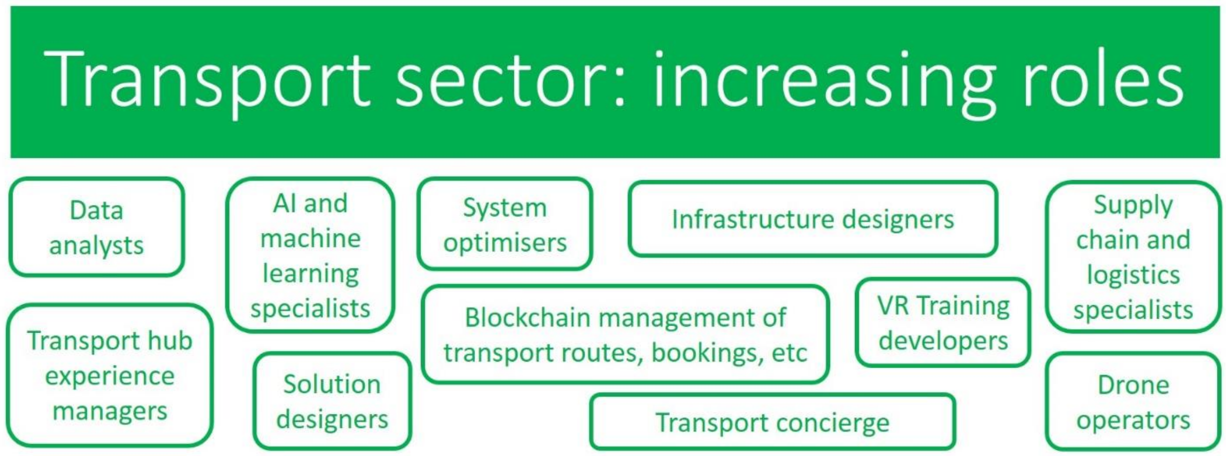
Roles and activities expected to increase



THE PUBLIC SECTOR

In most countries across the globe, the public sector is transforming, downsizing, revamping, and being overhauled. The pace and dimensions of this change are unprecedented - driven by budgetary constraints and new approaches to public service delivery. Public Sector refers to all levels of government - defence, education, federal government, health & human services, justice & security, local government, revenue, regulatory & central agencies, state and territory government, transport and infrastructure.

Trends driving change in the public sector

Businesses have become remarkably good at planning and then executing plans across complex, global supply chains. Similarly, many governments increasingly excel at setting boldly progressive policies and executing large, ambitious programmes. The problem for both is, the world is shifting under their feet.

A range of powerfully disruptive trends mark Globalization 4.0, among them there are four that stand out.

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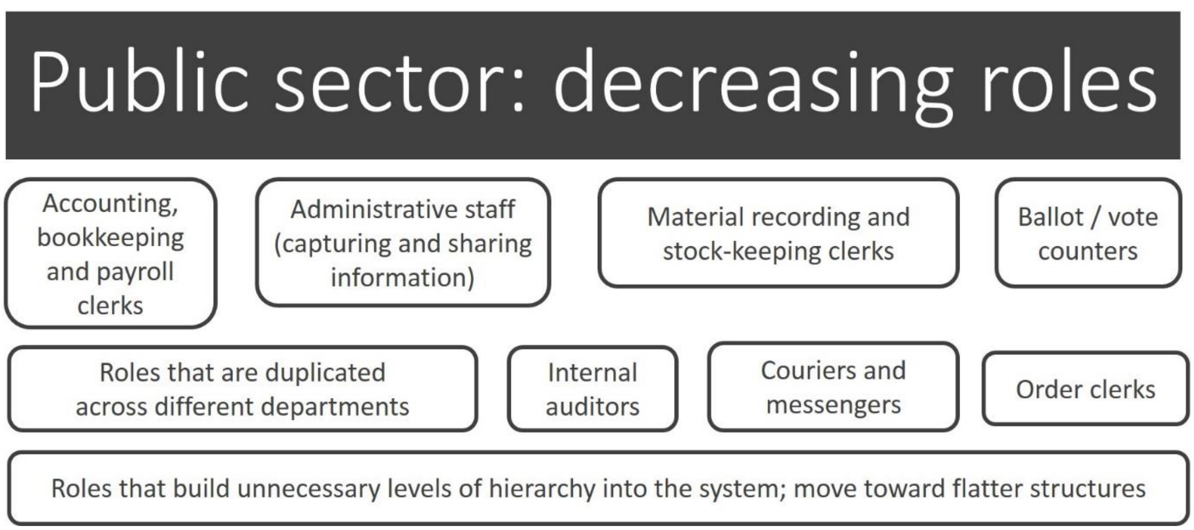
Fragmenting global order: Escalating trade conflict and eroding multilateral consultation on trade have significantly slowed (and sometimes reversed) what once seemed the inexorable advance of economic globalisation.

Expanding individual power: Ubiquitous access to information and increasingly potent social media tools give demanding citizens and consumers a far more powerful voice.

The Fourth Industrial Revolution: Technological advances are rapidly redefining how we produce, consume, communicate, and ensure human wellbeing. This is placing dramatically new demands on public policy and business performance, while simultaneously transforming the optimal means of delivering both.

Demographics: Millennials are pushing innovation and getting involved in government. Around 30% of the world's population is under the age of 30; yet young people do not really have a voice in government leadership. Millennials are making changes, and forming new systems and expectations of government.

Roles and activities expected to decrease



Roles and activities expected to increase

THE SERVICES SECTOR

The service industry is generally believed to require person-to-person contact in the delivery of mostly intangible products. Service industries include everything from business consulting to health care to education. Market trends in the service industry are being influenced primarily by the use of technology to streamline operations, provide resources to staff, and, in some cases, to replace the need for staff.

Business models offering access to assets or resources, the so-called **As-a-service models**, are enabled by technological advances, digital fluency and the establishment of communications platforms as well as by the trend where people prefer paying for 'access to' rather than 'ownership of' assets.

Globalisation enables a more mobile workforce – a person can be based anywhere and used by anyone in a global connected society.

Demographic shifts are having interesting effects on the service sector. Workplaces are becoming multi-generational with up to 4/5 generations in the same workplace. Younger people want more automation, while older people prefer the human touch; the 'in-between' generations require a balance between automation and the human touch, bringing interesting opportunities and challenges to the sector as a whole.

Innovations in technology mean that machines have the ability to aid and sometimes replace people. "Service robots" could become increasingly common in settings from homes to hospitals and the defence industry.

By incorporating technology into field service processes, organisations can do more work with the same number of resources, and benefit from more accurate resource plans and smaller service windows that improve both customer satisfaction and employee satisfaction. Artificial intelligence and advanced user interfaces hold promise.

Artificial Intelligence

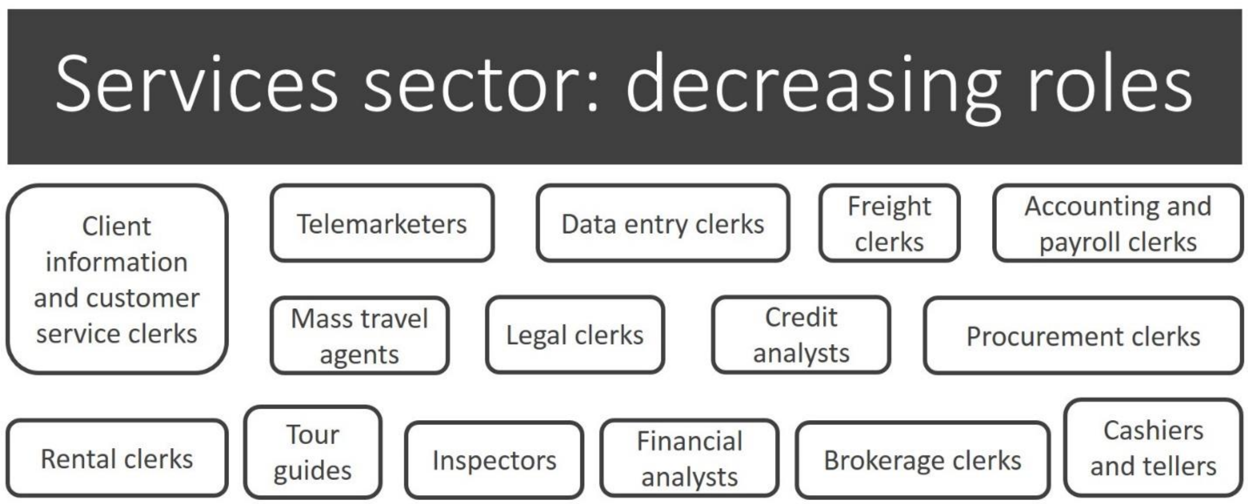
AI could be applied to identify the right field service management resource to address a particular task at a time that makes sense for both the customer and the business.

AI could estimate travel times, task durations and other key components of service delivery, enabling organisations to deliver greater efficiency and resource utilisation, improved effectiveness through better first-time fix rates, and faster responses to emergency situations. In addition, customer satisfaction is enhanced through customers getting a more precise estimate of when service will take place and an overall higher quality service.

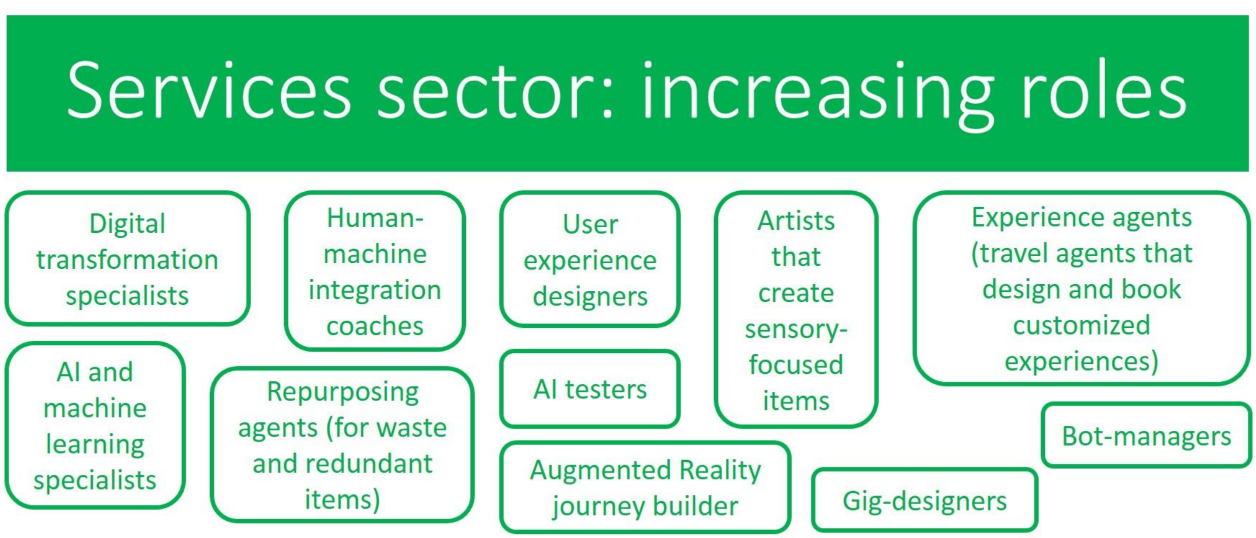
Advanced user interfaces

Advanced user interfaces enable computers to respond directly to a wider range of human requests, thus augmenting the work of highly skilled labour, while allowing some types of jobs to become fully automated. For example, Apple's Siri and Google Now rely on natural user interfaces to recognise spoken words, interpret their meanings, and act on them accordingly. Moreover, a company called SmartAction now provides call computerisation solutions that use machine learning technology and advanced speech recognition to improve upon conventional interactive voice response systems, realising cost savings of 60 to 80 percent over an outsourced call centre that employs humans.

Roles and activities expected to decrease



Roles and activities expected to increase



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THE EDUCATION SECTOR

In an increasingly globalised and connected world, education is the heart of economic and social prosperity – enhancing competitiveness and improving the lives of every single person.

Trends driving industry change

Globalisation: Within the next ten years, the majority of the world's population will consist of the middle class, a trend that is largely driven by China and India, which will make up 90% of the new entrants to the global middle class. This will not only increase pressure to provide better education for more people; it will also place higher expectations on education from more demanding customers.

As international mobility continues to rise, our systems will be under more pressure to integrate diverse students from all backgrounds. Between 1990 and 2017, the total number of international migrants grew from 153 to 258 million people, an increase of 69%. Today, social heterogeneity in classrooms already poses one of the biggest challenges for teachers. The challenge will be greater in the next 5-10 years. The stakes are great: inequality of opportunity can translate into disparities in well-being, and drive political and social unrest.

Digitisation: In 2017, three out of four internet users aged 16-74 used the Internet daily or almost every day. Whether it is a job, a room for the night, or the love of your life, online activity often translates into offline outcomes. And yet PISA (OECD Programme for International Student Assessment) results show that more time online in school does not automatically translate into improved student achievement. In fact, intensive use of the internet in school is linked to poorer student performance.

Improved **user interfaces** and **algorithms** building upon big data could have a significant impact on Education and how it is taught. The recent growth in MOOCs (Massive Open Online Courses) has begun to generate large datasets detailing how students interact on forums, their diligence in completing assignments and viewing lectures, and their ultimate grades. Such information, together with improved user interfaces, could allow for machine learning algorithms

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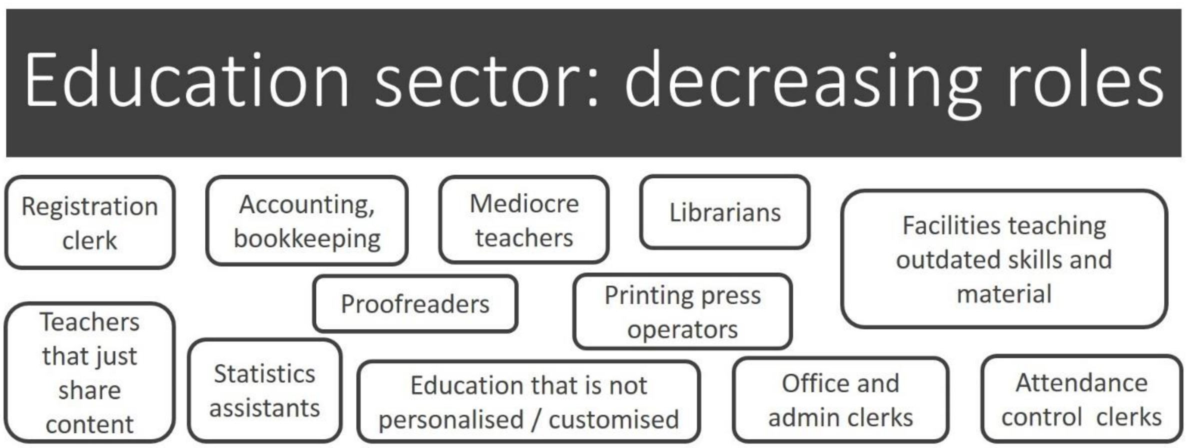
that serve as interactive tutors, with teaching and assessment strategies statistically calibrated to match individual student needs.

Ageing: In the last 45 years, life expectancy at birth has risen across OECD countries from an average of 70 to 80 years and the share of people aged 65 or older is expected to grow significantly. Older workers could face increasing labour market insecurity and pressure will mount for access to high-quality re-skilling and up-skilling opportunities. Yet current lifelong learning offerings in most countries seem to amplify, not moderate, deficiencies in initial education. (OECD Trends shaping education, 2019)

Roles and activities expected to decrease



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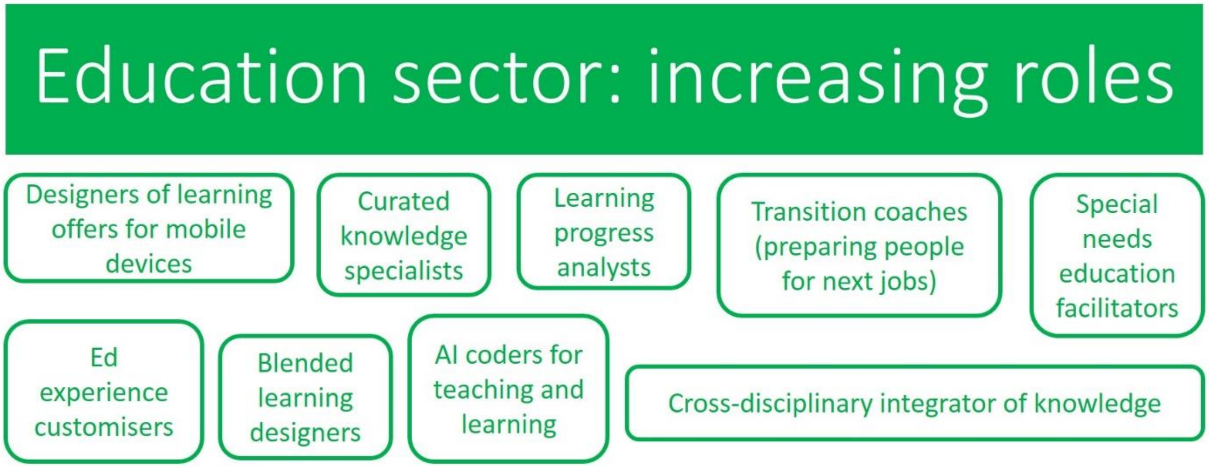
Roles and activities expected to increase



THE AGRI-PROCESSING INDUSTRY

Trends driving industry change

Urbanisation demands a different organisation of the food system in which the preservation of foodstuffs becomes strategic. This is accompanied, in middle-income developing countries, by a dietary transition stimulating new food categories, and by the demand for convenience and ready-to-eat foods.

Just as the market for consumer goods and services has changed over the last 20 years so have the characteristics that define consumers. Sharper distinctions can be drawn between different groups of consumers, and there is greater diversity among these characteristics. The key changes relate to demographics, the management of individual household finances, and time constraints.

Emerging technologies driven by the Fourth Industrial Revolution are disrupting the industry, bringing rapid and large-scale change. These include:

Digital building blocks such as big data, the Internet of Things (IoT), artificial intelligence and machine learning, as well as blockchain.

New physical systems such as autonomous vehicles, advanced robotics, additive manufacturing, advanced materials and nanotechnologies.

Advances in science such as next-generation biotechnologies and genomics, and new energy technologies.

The Internet of Things (IoT): In combination with blockchain, could enable real-time product tracking, reduce adulteration and shed light on supply and demand imbalances.

Mobile applications have the potential to connect consumers with an overabundance of food to those in need.

Online marketplaces could link consumers directly to farmers, dramatically simplifying supply chains.

Additionally, governments and other decision makers can leverage **big data and advanced analytics** to better understand supply and demand imbalances, forecast the impact of policies on neighbouring countries, and better understand the environmental burden of value-chains.

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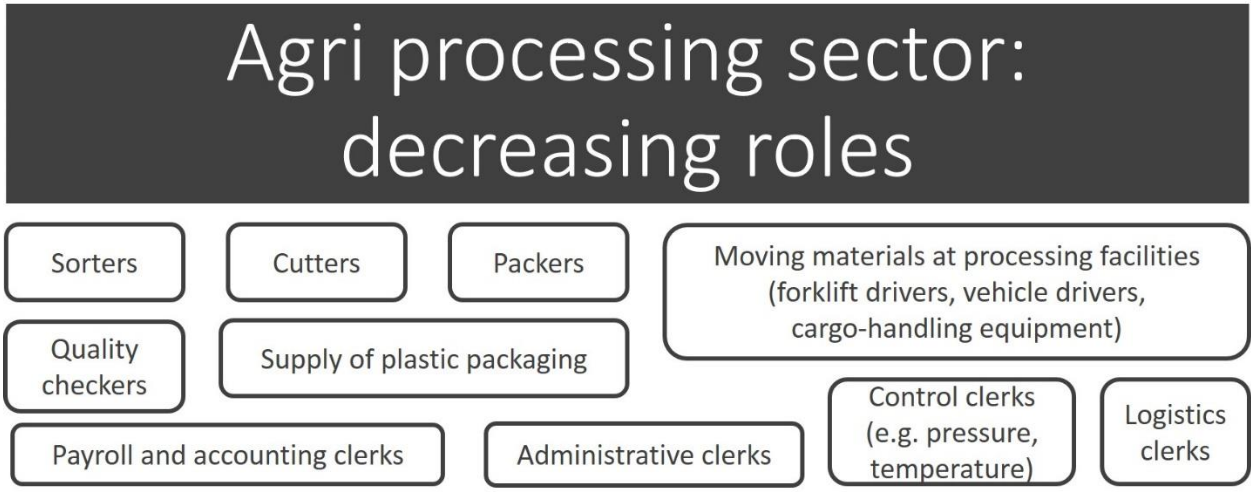
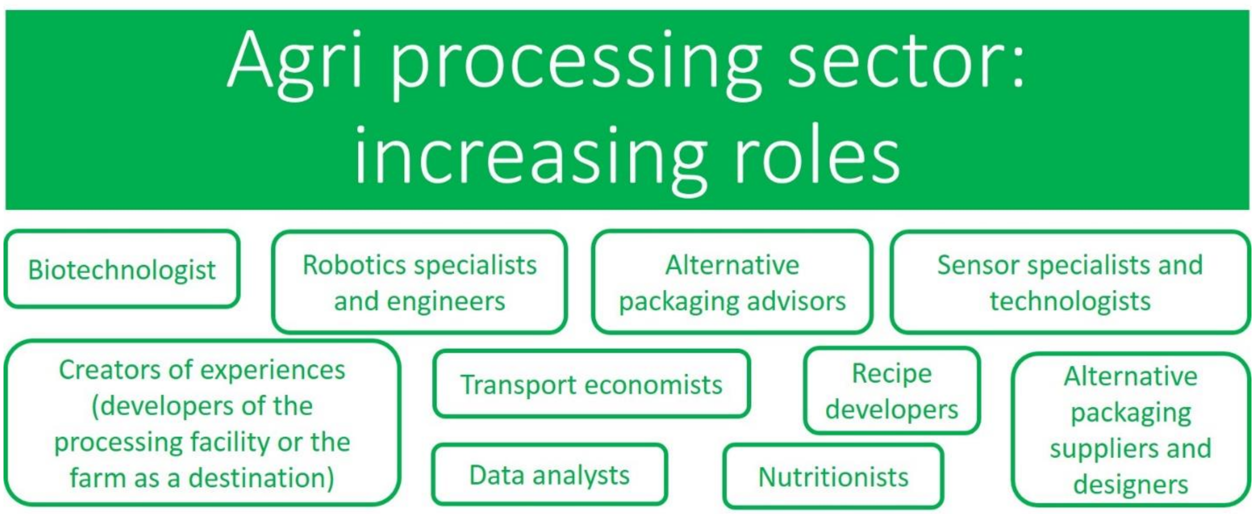
Roles and activities expected to decrease



Roles and activities expected to increase



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FINANCIAL SECTOR

Trends driving industry change

In South Africa, our financial services sector is made up of specialist firms, insurers, personal finance providers as well as retail banks.

A number of driving forces are shaping this industry:

Rapid digital adoption is the result of increased numbers of connected devices and a more digitally fluent population. This drives the adoption of on-line financial services and mobile banking.

Software platforms, digitisation and the development of applications make it easier to create and market financial services and as such, the barriers to entry into the market is becoming lower and the roles of traditional intermediaries are becoming less significant. The move to digital platforms also require a different skills set from employees in the financial services sector.

Better connectivity (in terms of both access and speed) is improving the ease of use of connected devices.

Customer preferences and expectations are changing; they expect the same level of personalised service (actually they increasingly want experiences) whether they engage via a mobile device, a call centre, an interactive display or a branch. They are also less loyal and would opt for a solution that match their expectations. In future, customers would probably not really differentiate between a bank and a 'non-bank' organisation offering financial services.

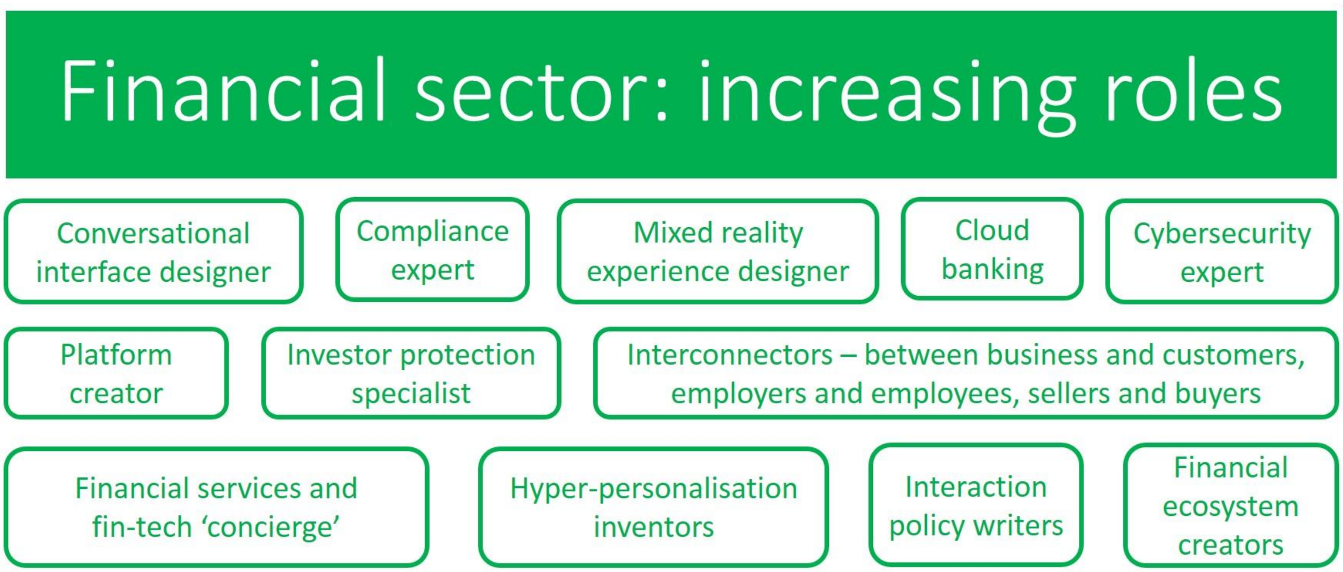
Emerging **alternative models of lending and capital raising** (like crowd funding) influence the market size and growth options of traditional lenders.

Technologies like big data analytics and artificial intelligence are changing the manner in which decisions are made, products developed and processes designed.

Non-traditional players are entering the market. Financial services will increasingly be offered by retailers, agricultural and other cooperatives, property developers, organisations in the automotive sector and even employers.

Roles and activities expected to decrease

Roles and activities expected to increase



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MINING INDUSTRY

Trends driving industry change

In South Africa, mining had a significant influence on how our economy and, in many places our societies, developed. At the moment, the sector is under pressure. **Falling commodity prices** and the **depletion of easier-to-reach ore bodies** put pressure on the profitability of mining operations. Mining in South Africa is mostly deep and therefore risky and expensive.

A number of **technologies** are showing interesting promise – **drone applications, proximity sensors and improved communication systems** are changing underground mining, while **software applications** are creating efficiencies across the whole operation.

Autonomous trucks and loaders are taking people away from the high-risk face of the mine, enabling the supervisors of these trucks and loaders to remain off-site, sometimes even miles away from the face, especially in open-cast mining, but increasingly so in underground operations as well.

Legacy systems in deep, narrow-reef underground mines could hamper the adoption of new technologies. It is easier when the initial design of a mine is based on new technologies than trying to 'retro-fit' and integrate it into an existing older system.

Improved methods of collecting and using data could increase efficiencies along the entire mining value chain by speeding up certain processes, allowing for more informed decision making and enabling more sustainable and safer operations.

Collaboration between business, labour, communities and government as well as with stakeholders along the whole value chain has always been important, but it will become critical in future.

Methods and technologies to re-mine existing waste dumps, refuse piles and abandoned operations are creating 'second life' opportunities in the industry.

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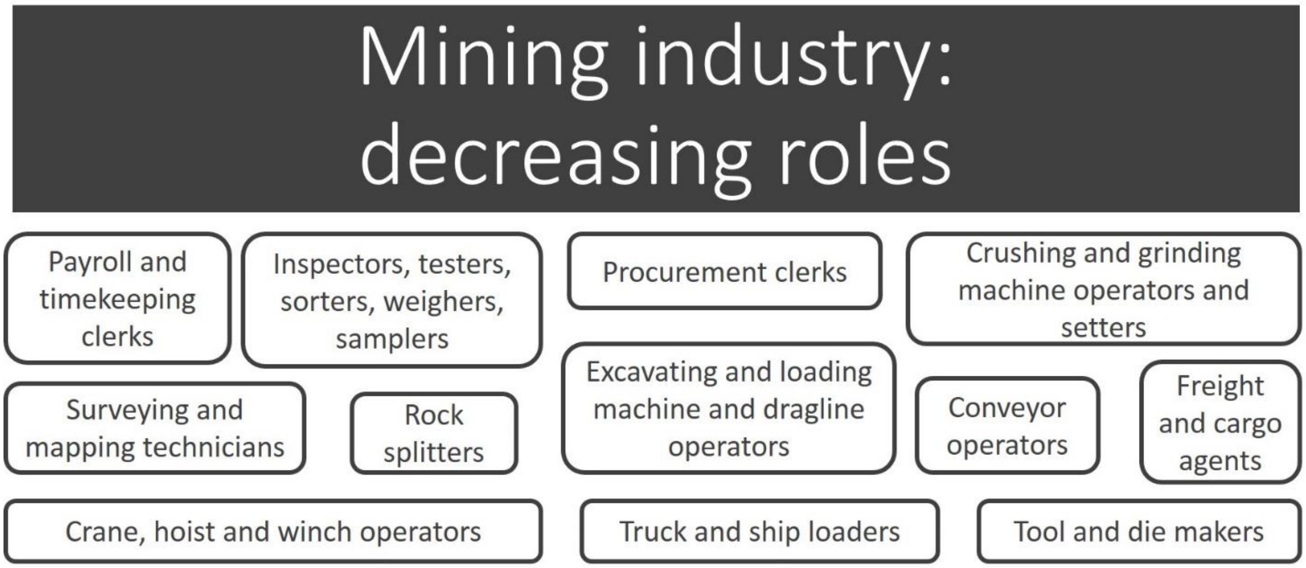
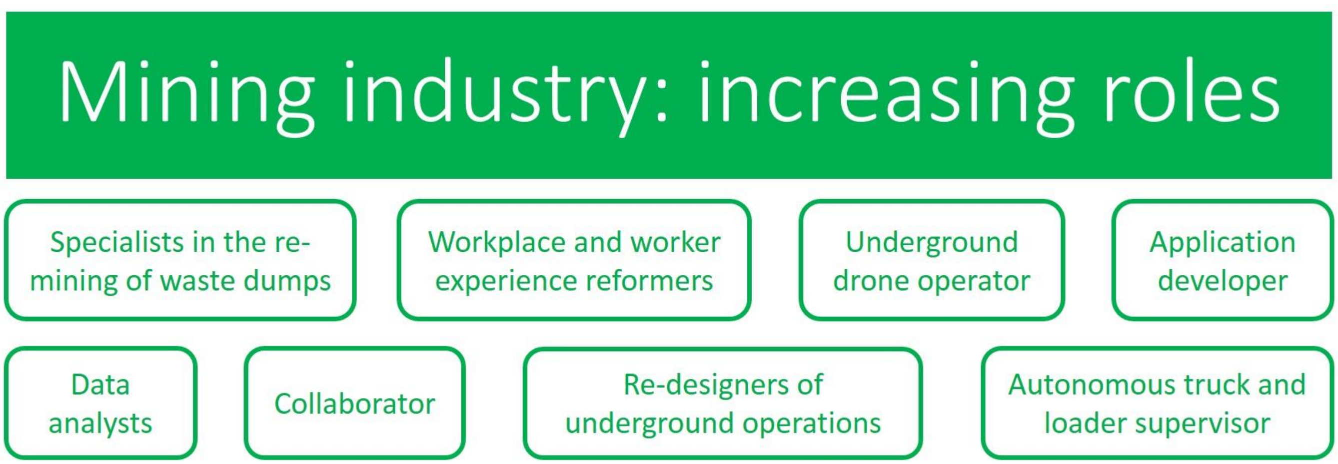
Roles and activities expected to decrease



Roles and activities expected to increase



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MANUFACTURING INDUSTRY

Trends driving industry change

South Africa has a well-established and diversified manufacturing base, supported by fairly efficient transport and logistics systems. A number of multinational organisations have operations in South Africa and we are in close proximity of emerging African markets. But, South African operations are quite expensive and our productivity levels are low in comparison to our other BRICS partners.

Competition from low-wage, high-productivity nations like Brazil, India and China will continue to have a significant influence on our local manufacturing sector.

Changes in **consumer preferences** and a general **slowing in individual consumption** in our traditional export markets are putting pressure on manufacturers, pushing them to find markets for their products elsewhere.

Our **currency** is one of the most volatile in the world and will probably remain so for some time to come; it has a significant influence on the profitability of manufacturing operations that trade globally.

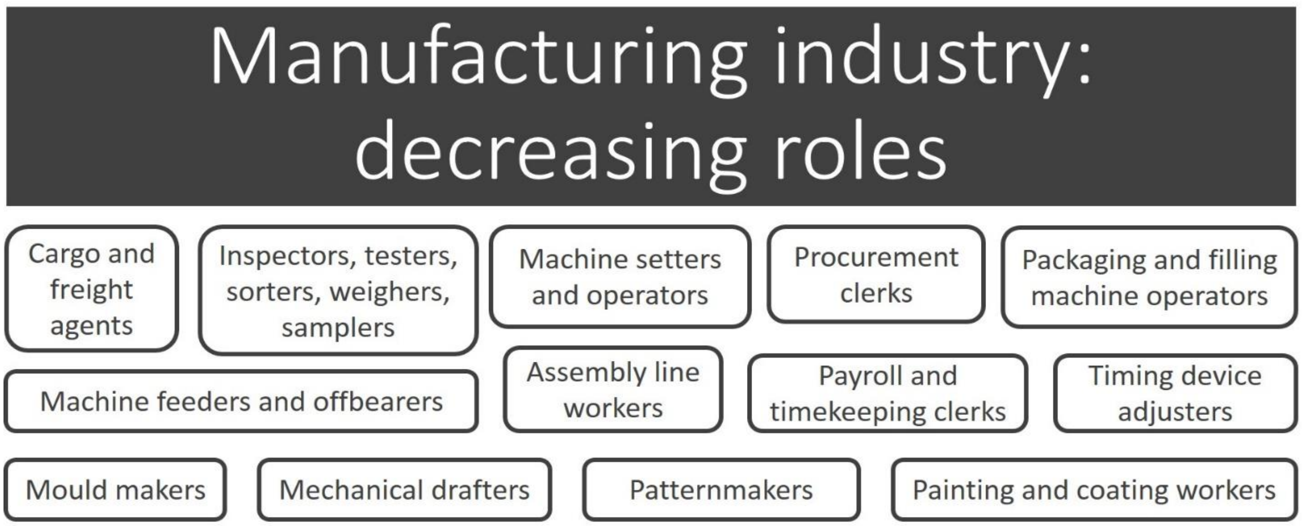
The growth in the number of people, especially from the rest of Africa, reaching **middle income status** holds promise for manufacturing; these 'new' consumers is a potentially lucrative market in relative close proximity to us.

Automation and digitisation of manufacturing processes as well as processes along the entire value chain will continue to influence the number and kinds of jobs in the industry.

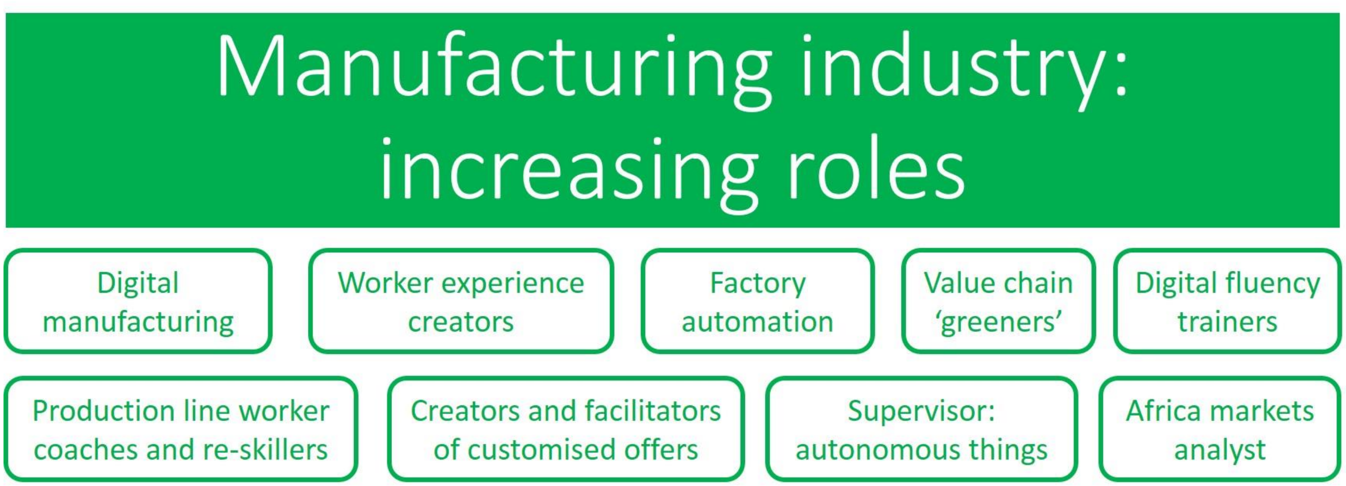
Automation and digitisation facilitates the **crashing of the value chain**, reducing (even eliminating) the need for intermediaries and bringing the manufacturer in closer contact with the final consumer. It opens opportunities like manufacturers offering consumers hampers of products on subscription basis or consumers being able to engage with manufacturers directly to order a customised product.

Technologies like mobile applications, sensors, next-generation robotics, autonomous things, artificial intelligence, 3D printing, wearables, nanotechnology, and advanced materials could change not only the kind of products produced but also the way in which it is done.

Roles and activities expected to decrease



Roles and activities expected to increase



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AUTOMOTIVE INDUSTRY

Trends driving industry change

The trends driving change in the manufacturing sector, will also be applicable to the automotive industry. In South Africa, the automotive industry is a significant player in terms of manufacturing value added in the manufacturing sector.

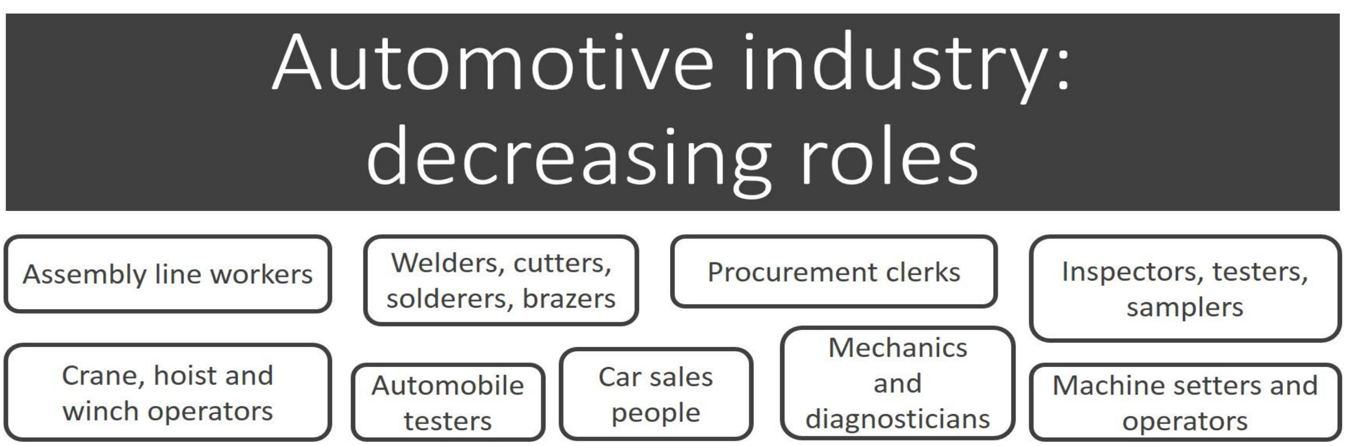
The trends driving change in the transport industry will similarly influence the automotive sector.

One of the factors having an influence on the global automotive industry, is increasing **environmental pressure**, tied to emissions legislation that is getting more strict and to the rising cost of (and resistance against) fossil fuels.

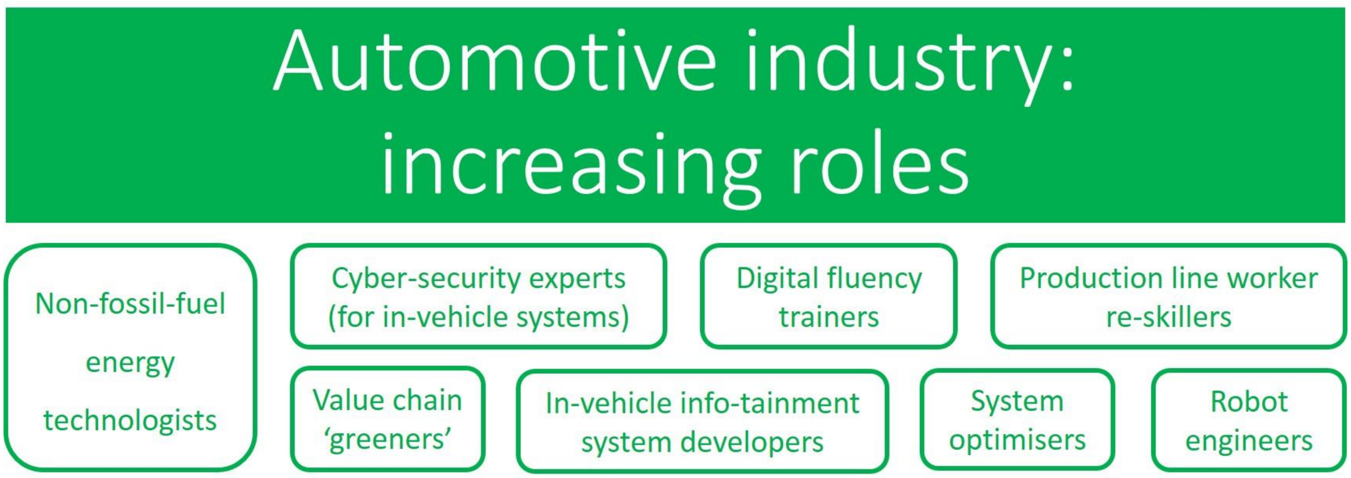
Towards 2030, the industry may experience **structural shifts in market demand**, with full electric or hydrogen fuel cell vehicles entering the market.

Customer preferences are changing; in developed economies demand is increasing for safer, technology-enabled vehicles not running on fossil fuels, while in developing economies the bulk of consumers want smaller, more basic vehicles.

Roles and activities expected to decrease



Roles and activities expected to increase



AGRICULTURE INDUSTRY

Trends driving industry change

Being increasingly aware of the environmental and of the nutritional implications of the production and consumption of certain foods, consumers may demand that their food meet minimum sustainability and health requirements. This information can be made available to them by packaging-based blockchain apps. Consumers may switch their diets to plant-based or cell-grown alternatives or demand that the animals they eat be fed insect-based proteins.

Farmers could use **mobile services** to obtain valuable pricing information and gain access to markets on both the supply and distribution sides.

Combined with **big data and analytics** and **blockchain**, improvements could be seen in financial inclusion for farmers by reducing adjudication costs and lowering cost to serve.

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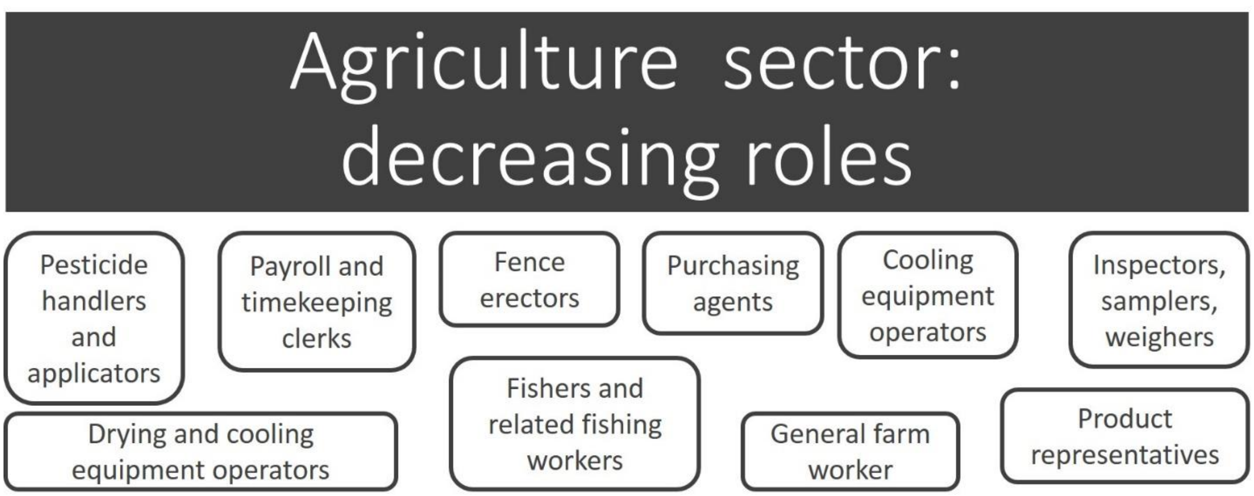
Gene-editing technologies such as CRISPR-Cas could provide a way to achieve multi-trait improvements, producing a step change in productivity while improving the drought resistance and nutritional content of food.

Advanced precision agriculture technologies that deploy machine vision, big data analytics and advanced robotics could allow farmers to apply the optimal amount of inputs for each crop and assist with the management of livestock and aquaculture, thereby boosting yields and reducing water use and greenhouse gas emissions.

Some of the **challenges** facing the industry, are the effects of climate change, land reform, crime, water availability, inefficient agro-logistics, and a challenging investment environment.

Opportunities are offered by improved productivity, growing population numbers, increasing consumer spending, new markets (especially in Africa and Asia), and new technologies.

Roles and activities expected to decrease



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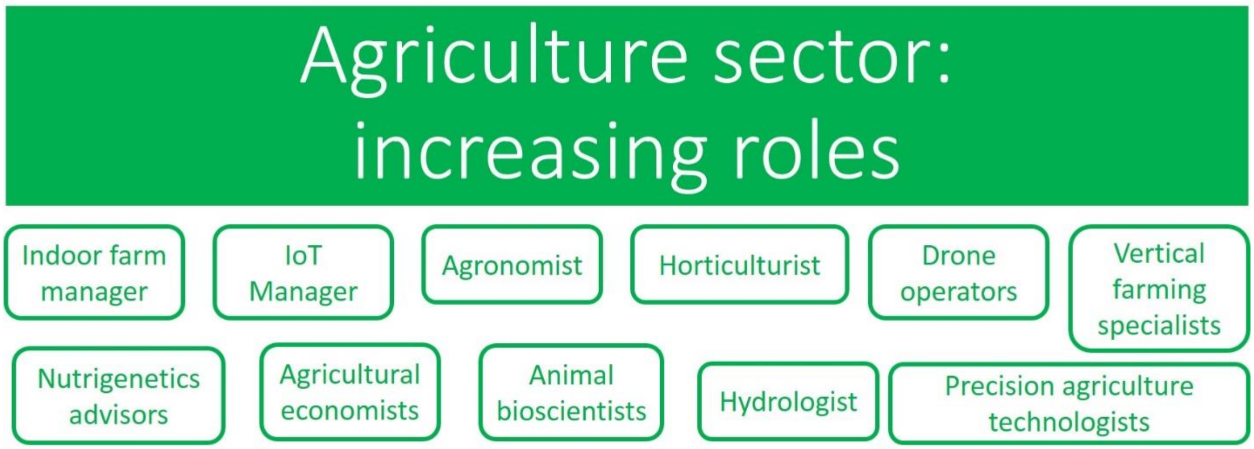
Roles and activities expected to increase



SCENARIOS: THE WORLD OF WORK IN SOUTH AFRICA IN 2030

A set of scenarios about work in South Africa in 2030 was generated as part of the research process. Facilitated by the Institute of Futures Research, NEDLAC constituents met on two occasions to work on the scenarios:

- On 11 February 2019 NEDLAC constituents, as well as delegates from the local ILO branch, identified 12 driving forces and performed an impact analysis.
- On 25 February 2019 NEDLAC constituents, ILO representatives and IFR research colloquium members constructed the set of scenarios.

Scenarios reflect our assumptions about how current trends could unfold, how critical uncertainties could play out and what new factors could come into play. A set of scenarios can never provide a comprehensive image of the future; it is not the only possible construct of uncertainties and is not based on precise or the only assumptions about driving forces or how trends could unfold. But, they hold the potential of 'rehearsing' possible futures, offering opportunities to deepen insight, enrich debate and promote a shared understanding of where and how stakeholders can influence the future.

IDENTIFICATION OF THE DRIVING FORCES

Each constituency (joined by ILO delegates), deliberated and identified 3 - 4 forces that they regarded as the ones that would be key to shaping the future of work in South Africa over the next 10-12 years. Each constituency shared the forces that they identified with the combined group and, after discussion in the combined group, the following 12 driving forces were identified:

- The **4th industrial revolution**. Jobs and opportunities changing as a result of the 4IR.
- **Inequality.** Jobs and access to jobs influenced by inequality in the society.
- **Empowerment of individuals**. This includes access to technology, access to information, and people taking responsibility for their own future.

- **Economic power shifts**. More people reaching middle income, more SMEs, a bigger informal sector.
- The need for a **social compact**. Social partners working together in cooperation, a collective approach to address inequality, innovation, less bureaucracy.
- **Employment policy**. Collective agreement on national employment policies, being sure what we are aiming toward (e.g. high volume, low skill); how we plan on moving toward a future better skilled workforce; youth employment included in the employment policy; identifying enabling sectors; using technology; a sectoral approach in terms of the employment policy is key.
- **Appropriate skills**. A situation where skills development is responsive to labour market needs; IT literacy is regarded as critical; 'clearing' other issues (like fees must fall) from the agendas of educational institutions so that they can focus on their actual task.
- **Infrastructure.** The need to have water and electricity and connectivity; the issue of urban vs rural; hubs – for capacity and the building of support.
- **Profit motive / objectives**. How organisations maximize their profits and how much they expect to make. Profit objectives are usually set at the beginning of a financial year so when the organisation looks at ways to maximise profit, the issue of technological/4IR plays a role. At the moment organisations want to make sure that they get as much revenue as possible and when they want to cut costs it is usually the labour costs that is on everybody's mind.
- **Women participation.** In the labour market
- **Digital fluency**. All people will have to become digitally fluent. The language that will be used to train on/introduce/explain new technologies is important; we have 11 languages in SA.
- **Climate change**. Influence of climate change on opportunities.

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ANALYSIS OF THE DRIVING FORCES

A first level of deeper analysis was done using the Intuitive Logics approach, where each driving force is evaluated in terms of its perceived influence as well as its level of uncertainty. Figure 11 illustrates the outcome of the analysis.

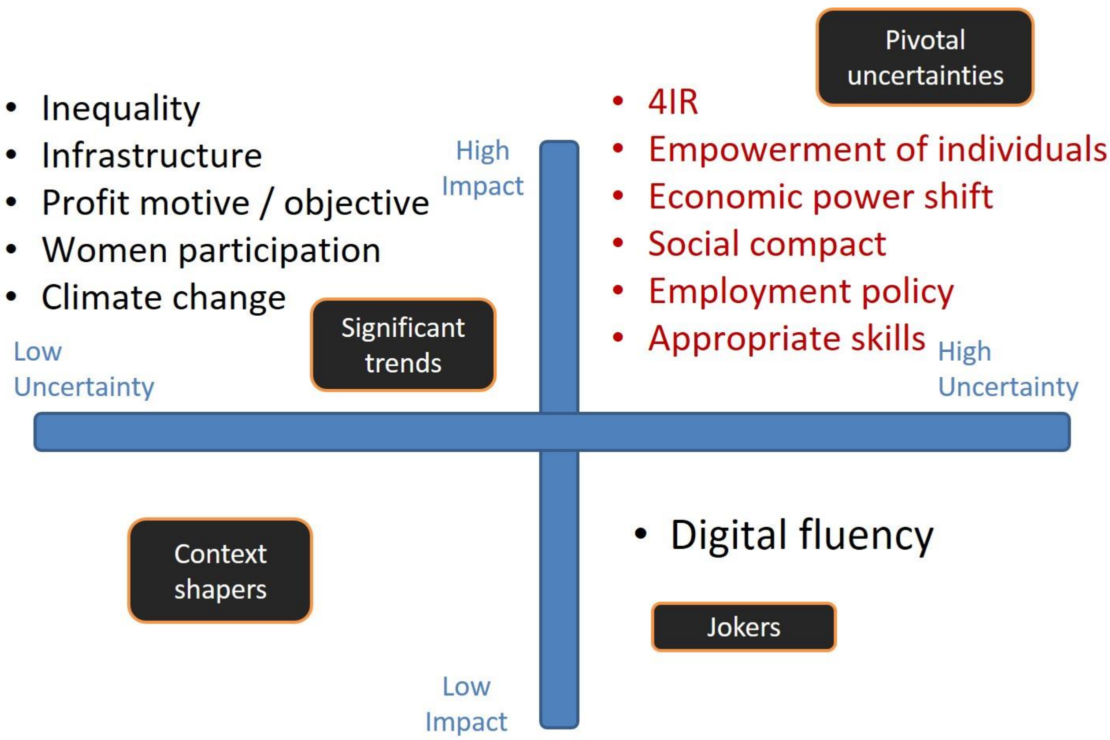

Figure 11: Analysis of driving forces

The six pivotal uncertainties were further analysed, using an impact analysis tool. The influence of each factor on each of the other factors was considered and scored by the workshop participants. This type of analysis provides both an active and a passive score for each factor. The active score indicates how strongly a particular factor influences the other factors, while the passive score indicates how strongly that factor is influenced by the other factors. Different combinations of active and passive scores point to different types of factors:

- **Critical factors** have high active and high passive scores. A critical factor has a strong influence on other factors and is strongly influenced by other factors. Observers should keep track of changes in the status of these factors at all times, and use that to influence a system; these factors often form either virtuous or vicious circles. Critical factors are frequently used as the axes for generating scenarios.
- **Active factors** have high active scores and low passive scores. They have a strong influence on other factors, but is weakly influenced by other factors. Active factors make effective levers; it may be possible to have a significant effect on the system through intervention.
- **Reactive or passive factors** have low active scores and high passive scores. They exert a weak influence on other factors, but are strongly influenced by other factors. In a system, the reactive factors are useful indicators of the effects of interventions; when they show change, it means that the other factors are changing (or interventions are working).
- **Buffering or lazy factors** have low active scores and low passive scores. They have a weak influence on other factors and are weakly influenced by them. These factors are usually 'in plain sight' but decision makers should accept that they will not be the driving factor; they could deplete resources invested in it without generating major changes in the rest of the system.

The outcome of the impact analysis of the six pivotal uncertainties is illustrated in Table 13.

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Table 13: Impact analysis of six pivotal uncertainties

Influence of ⬇ on ➡	Score	Type
4IR	High active; Low passive	Active
Empowerment of individuals	High active; High passive	Critical
Economic power shift	Low active; High passive	Reactive
Social compact	Low active; Low passive	Buffering
Employment policy	Low active; High passive	Reactive
Appropriate skills	High active; High passive	Critical

The impact analysis identified the **empowerment of individuals** and **appropriate skills** as the two critical factors and hence the factors that would make up the two axes for a scenario set.

Participants in the scenario generation activity were reminded to keep the roles that the active, reactive and buffering factors as well as the significant trends (inequality, infrastructure, profit motive, women participation and climate change) and the joker (digital fluency) play, in mind while they contemplated plausible futures.

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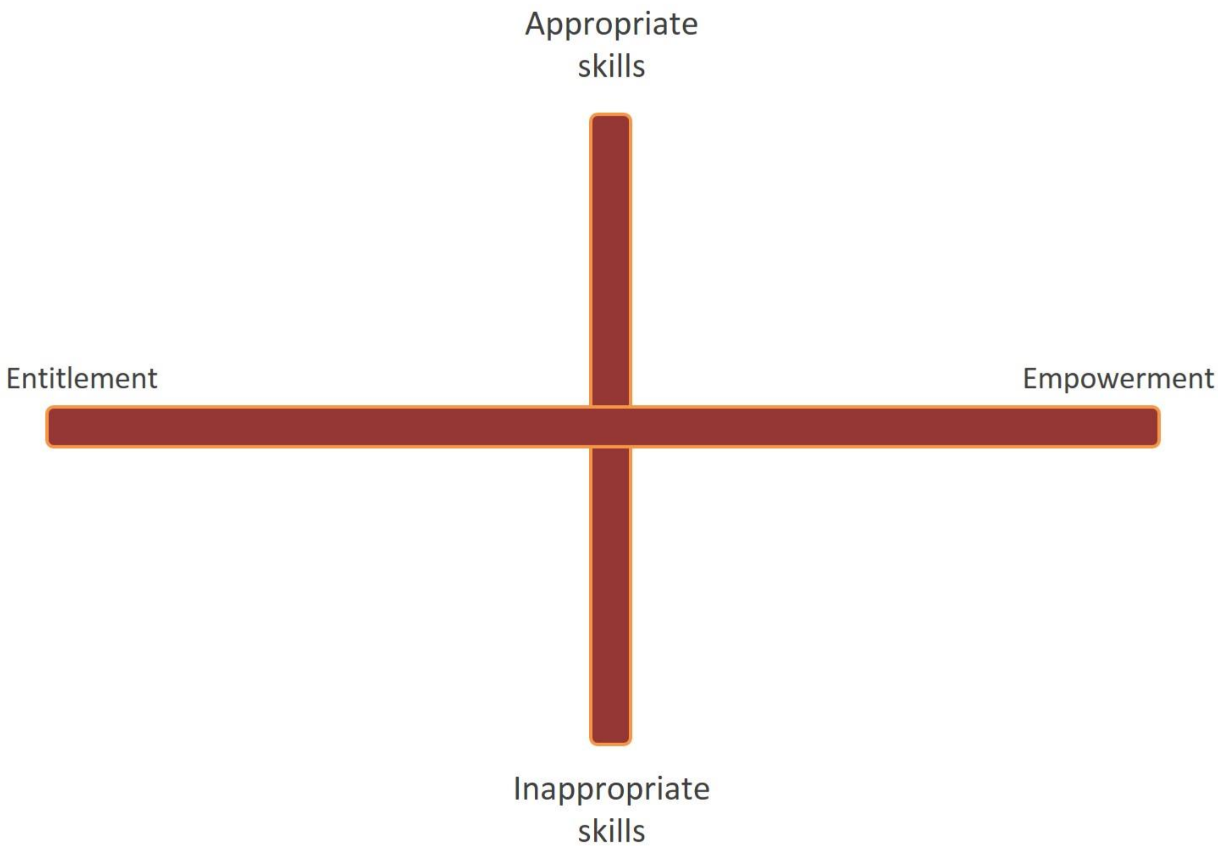


For the purposes of this exercise, the two polar outcomes on the continuum for the **empowerment of individuals** were defined as:

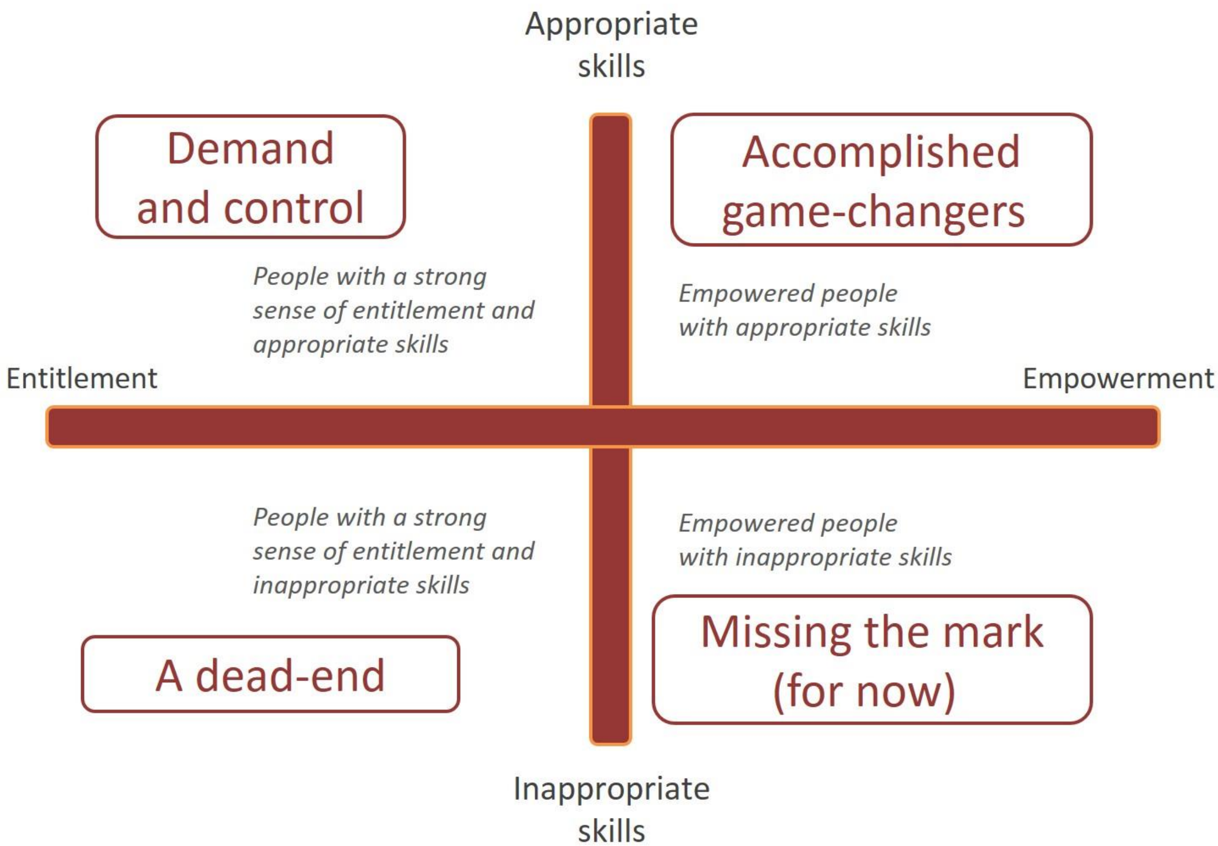
- Entitlement: the sense (sometimes to the level of being unrealistic) that one is deserving of special treatment or privileges, having the right to something. It is the state of mind where individuals have the unhealthy belief that they deserve special treatment because of special circumstances.
- Empowerment: the ability to do something about your needs, wants and opinions. It further refers to the measures that are put in place to increase the degree of self-determination and autonomy in people and communities, to enable them to act on their own authority and represent their interests in a responsible and self-determined manner.

For the purposes of this exercise, the two polar outcomes on the continuum for **appropriate skills** were defined as:

- Inappropriate skills: Skills that do not enable a person to gain meaningful employment, either because it is not at the right level or because it is not the type of skills that the market requires.
- Appropriate skills: Skills that allow a person to gain access to economic opportunities. A person with appropriate skills has skills that are at the right level and it is the type of skill that the market requires.

GENERATING THE SET OF SCENARIOS

Scenarios were generated during the second workshop, on 25 February 2019. Four groups of people were formed, each consisting of a random mix of NEDLAC constituents, ILO representatives and IFR research colloquium members. Each group focused on one of the four scenarios, generating detail about what work could look like in that particular scenario in 2030. Their outputs are captured here.



A DEAD-END

People with a sense of entitlement and inappropriate skills.

In 2030, we are going down a cul-de-sac; a dead-end road. There are some positives (like patches of economic growth), but mostly negatives:

- We experience a large amount of unrest; we see a lot of smoke from things being burned during uprisings.
- There is more segregation (now it is along income lines, not along racial lines like before).
- There are minimal opportunities for the kinds of skills that our people have.
- There is a huge strain on infrastructure (we could not develop suitable infrastructure because we did not have the appropriate skills).

- On top of everything, there was a skills exodus – of the middle class of the country; skilled people from all race groups went elsewhere because in our country they saw no future for themselves.
- Government in 2030 in this scenario is misaligned; everyone is looking after their own patch only; self-interest rules and there is little to no collaboration or sharing of information.
- Existing frameworks are challenged by our people. They have a strong sense of entitlement; they demand jobs regardless of being inappropriately skilled
- The mental models of people in business, organised labour, government and the community center around negativity, blaming, generalisation, and fear.

In terms of skills development, business spent minimal money on developing people, labour focused on protecting existing jobs and did not collaborate with other parties about developing next skills, and government concentrated on retaining the majority vote and portrayed a very short short-term view of the kind of skills required.

In this scenario, the social compact deteriorates because each of the social partners are focusing on their deemed immediate needs and rights and not on what is best for the country as a whole over the longer term.

Regarding the 4IR, there is continuous civil unrest – people are protesting the fact that robots are taking their jobs. Labour rejects anything that reeks of 4IR and they organise protests and strikes, creating chaos in many industries. Business adopt the new technologies to remain profitable and protect their interests. Government is getting more and more isolated, partly because they did not embrace the potential positive effects of the 4IR, or put measures in place to mitigate against the negative outcomes thereof.

DEMAND AND CONTROL

People with a sense of entitlement and appropriate skills

In 2030, we are seeing the development of a new kind of economy:

- Government in South Africa is bigger than it has ever been before; it rules the decisions about which industries to develop, what skills people should attain (individuals don't have a lot of say in it themselves), and where resources should be allocated. The bigger government needed a bigger tax base, so all taxes increased significantly.
- Economic activities are undertaken with the primary aim of being good for the nation, rather than for making a profit.
- Certain industries are earmarked by government, and they are receiving the bulk of funding for development.
- Government and business worked together to attract foreign investment to develop 4IR initiatives.
- Certain skills were identified and suitable people were selected to be developed into attaining those skills. This control is very important – there is a vision and it guides the development of skills throughout the whole country.
- Collective bargaining now also includes organisations representing the informal sector. In fact, many activities that were previously regarded as informal, are now regulated.
- There is a very active citizenry and labour force; they engage with government and business through new forms of collective bargaining (mostly platform-based) to claim what they feel themselves entitled to.
- We see frequent social uprisings and strikes as a result of unmet demands.

We call this scenario Demand and Control, because it describes what happens. There is a constant tug of war between government wanting to control (they design plans for society and individuals) and what those individuals demand based on what they deem themselves to be entitled to. But, as a nation, we are succeeding in developing the appropriate skills. Our people are able to work and earn a livable wage, mostly in permanent jobs in the designated industries, under the guidance of a descriptive and directive government. Collective bargaining now

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happens between government and a newly formed coalition of business, labour and the community.

MISSING THE MARK (FOR NOW)

Empowered people with inappropriate skills

The group that generated this scenario, defined empowerment as self-agency, initiative, strong commitment, belief, and determination to take ourselves and our community to the next level.

Here in 2030, we have a few things going for us. We have:

- empowered people
- an environment to facilitate engagement and consultation for communities and stakeholders
- governance structures that facilitate consolidation and negotiation
- empowering initiatives, free access to internet/Wi-Fi and distribution, but with outdated tools and technology.

Now that we have come to 2030, we realise that there are a number of unfortunate realities:

- There is a lack of a clear country response in terms of the 4th industrial revolution.
- Our people have obsolete skills, mostly as a result of their initial resistance to change – in the early 2020's there were numerous uprisings where labour resisted re-skilling and upskilling initiatives; they wanted to protect existing jobs that were rapidly becoming obsolete.
- There is a general lack of communication, and very poor inter-departmental coordination on what the appropriate skills are. Departments of education are not coordinating with the private sector (or anyone else).
- We made very slow progress towards an uptake of green jobs (it is getting better, but we started too late).

Now that we look back to 2019, we would have done a few things differently:

- We would focus on basic needs and the question of how we meet those to ensure that people are empowered with appropriate skills by 2030. Higher education and basic education move or change very slowly; we will strive to make it more agile.
- We would ensure that the discussion on climate change was more effective and optimal. We realise that we did not fully understand the potential influence of climate change.
- We would focus very heavily on communication; to package information for the people who will be affected. People need time to adapt and to understand that there will be a change in their employment and to understand the challenges. We will seek engagement, understanding and sharing knowledge.

Most of our issues resulted from timing - there were many initiatives, but they were very disjointed. We did not see a great change in time for 2030. However, the structures and environment are a lot more enabling than what it was in 2019 and we believe that we will see the benefits as a result of the enabling environment being in place and our people operating from a true sense of empowerment. If only we realised that our skills development initiatives were stuck in the past.

ACCOMPLISHED GAME-CHANGERS

Empowered people with appropriate skills

Accomplished game-changers are accomplished because they have the appropriate, in-demand skills, and they are game changers because as empowered people, they change the rules of the game - they change the labour market for the better. In 2030, empowered people – women and men – with the right skills are active agents of change.

An empowered person is someone who also empowers others – lifting up others, with the skills that you have. So we are not only talking about empowered people, but empowered families and communities.

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What is necessary for people to be empowered? Empowered people have access to information, technology, infrastructure, electricity, social protection, education and lifelong learning. With this in place, they have the power to make active life choices based on available alternatives and information, in line with their own life goals and priorities.

In this scenario, we see:

- Women and men that are equal, active, empowered agents of change
- People are not confined to 9-5 jobs
- It is not uncommon to have more than one employer
- Shift has taken place in terms of rural structures or traditional culture roles
- Technological innovations -> increased productivity and reduced working hours
- Improved job quality, quality of life and work and family balance
- There is no discrimination in the labour market
- No one is considered unskilled/low-skilled or inappropriately skilled
- No one is constrained by narrow gender norms
- Patriarchy is minimised
- Individuals, families and communities are empowered
- No segregation between public and private sectors
- People are comfortable with and willing to work with AI, but humans are in command
- Reskilling and life-long learning is a given
- Quick access and open access and AI become the enablers of new knowledge in rural and urban areas alike
- "Balloons" of infrastructure that facilitate Wi-Fi access to the cloud and markets
- People and their activities are not confined in one office space
- Most people have cross-sector skills

People are continuously attaining appropriate skills, because all parties are working together in an efficient manner. Government ensures policies that enable skills development and lifelong learning, with curriculum development and content that is up-to-date, practical and inter-disciplinary. Business encourages and supports lifelong learning by their employees, they collaborate with labour and skills development organisations to ensure that appropriate skills are developed and with government to provide adequate infrastructure and an enabling environment. Labour works with business, government and skills development organisations to ensure a fair and just environment, where people constantly have re-skilling opportunities that is relevant for them. Communities are benefitting from people's empowerment and skills, individuals are active agents of change, ploughing back into their communities, not hindered by traditional gender and other social norms.

In this scenario, South Africans have access to and are in command of technological equipment and robots, where AI supports humans and thereby increases productivity and reduces human working hours. People have improved job quality and quality of life, with a better balance between work and family, and they contribute to reducing inequality in SA. People are healthy and have reduced working hours, good job quality and decent, livable remuneration. A mental shift happened – we are not working against the 4IR, we are working alongside robots/AI.

We now have a custodian minister of people, who looks after the role that people play in the world of work. Back in 2019 we had a minister of labour, but here in 2030 the scope is much wider and this minister is held in very high regard – it is one of the most important posts in government.

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CONCLUDING REMARKS

This research project highlighted a number of insights:

- If we continue on our current path, South Africa's economy and her people may suffer greatly.
- We are in a position to gain from a demographic dividend, but only if our working age population have the appropriate skills.
- The reality is that we are competing against international providers that have access to low-cost, productive labour and locally, our people will increasingly 'compete against' robots, automated systems, and machines that learn and are able to perform the same activities with higher efficiency and at lower cost.
- Education needs a total 'face-lift'; the entire education environment, from pre-school to post-graduate education, needs to be re-imagined and aligned with emerging skills requirements. Life-long learning must become an imperative; not simply a 'nice-to-have'.
- We should not steer ourselves toward a situation that pegs people *against* robots, automated systems, and machines that learn, but rather one that works toward people working *with* new technologies.
- Leaders on all levels of society should engage with their people, to facilitate understanding and share knowledge and insights about emerging opportunities and potential threats.
- The outcomes and insights gained from this research resonates with the three pillars of recommendations in the ILO Global Commission on the future of work report, namely investing in the capabilities of people, investing in the institutions of the world of work and investing in decent, sustainable work.

A number of non-negotiable truths exist:

- The 4IR is a given
- Production could happen without people. This implies the potential substitutability of smart robots and artificial intelligence for human beings in the labour force in the primary, secondary and tertiary sectors of the economy.

- Economic growth is not the panacea to job creation
- The growing democratisation of the workplace presents the firm possibility that full-time employment contracts might, in some instances, give way to less formal, gig-economy workplace agreements.

Given the above, the labour landscape, in the event of inappropriate skills and entitlement, will be very unfavourable for the majority of workers in South Africa and they will indeed run the risk of being replaced by robots, automated systems and machines that learn. That said, we do have a young population creating the opportunity for a demographic dividend which will probably only be fully exploited in the event of appropriate skills development and a growing sense of empowerment. In this kind of scenario labour is augmented by 4IR artifacts and increased production creates more jobs. It should be noted that, in the short run, a number of jobs may be destroyed; in the longer run, however, new job families are likely to be created. This is a typical manifestation of the process of creative destruction.

One of the key imperatives to both escape the Dead-end scenario and to achieve the Accomplished Game Changers scenario is a total re-haul of the education / training / skilling system. Here all stakeholders have roles to play.

NEDLAC should play a leading, coordinating, orchestrating, integrating role in engaging all the relevant stakeholders, and a social labour market compact should be facilitated. The trade-off between efficiency and equity should be taken into account; decision makers should explore the trade-offs and design policies and procedures that both acknowledge that trade-offs exist and reward efforts to mitigate job losses, reduce poverty and narrow income inequality.

NEDLAC is a well-established organisation, respected for its role in bringing stakeholders together and facilitating social dialogue. As such, NEDLAC could also bring the voices of the unemployed and people involved in the informal economy, as well as those who do unpaid work (like caring for family members) and small business to this discussion.

Moreover, NEDLAC could be instrumental in ensuring more investment towards digital infrastructure. This will not only help to close the digital divide, but also contribute towards sharpened digital fluency.

NEDLAC could consider further research on topics such as:

- Issues other than skills that influence access to economic opportunities in SA (gender, age, geographic location, vulnerability, etc)
- The futures of worker representation, collective bargaining and the role of trade unions

All four of the scenarios that were generated as part of this research, are plausible. The preferable scenario is that of the Accomplished Game Changers and, in the words of President Cyril Ramaphosa during his address at the launch of the ILO Global Commission on the Future of Work report: "… we are optimistic that with the right approach, an approach that is proactive and inclusive, we can achieve what we set out to.'

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