

FACT SHEET



**FACING THE FOURTH
INDUSTRIAL REVOLUTION:
WHAT ARE SOUTH AFRICA'S
CONSTRAINTS?**

INTRODUCTION

In explaining what the Fourth Industrial Revolution (4IR or Industry 4.0) entails, the definition of Klaus Schwab (founder of the World Economic Forum) is widely cited. He explains the Fourth Industrial Revolution as being characterised by a fusion of technologies that is blurring the lines between the physical, digital (virtual) and biological spheres (Schwab, 2016). Based on the definition, it is clear that 4IR refers to a complex set of technologies that has already transformed the work and social lives of contemporary humans. In facing the challenges 4IR poses to South Africa, this Fact Sheet will provide a succinct discussion on some prominent 4IR technologies that already exist and reflect on South Africa's readiness to adopt this new reality. It will also allude to the role human resource professionals can play as change agents in facilitating this complex adaptation.



FOURTH INDUSTRIAL REVOLUTION TECHNOLOGIES EXPLAINED

In order to comprehend the pervasiveness of 4IR, it is necessary to understand where the term originates. The world has witnessed an evolution of economic systems (four) that have had major economic impacts over the centuries. The First Industrial Revolution commenced at the end of the 18th century using steam and water to run production, specifically in the iron and textile industries. After a period of growth and expansion, the Second Industrial Revolution emerged at the beginning of the 20th century with the invention of electricity. The use of electrical power became the driving force that enabled mass production which revolutionised the steel and oil industries. Some of the major developments in this period include the telephone, light bulb and the internal combustion engine.

Around the 1970s, the so-called ‘Digital Revolution’ heralded the Third Industrial Revolution. The use of electronics and Information Technology (IT) changed the ways in which humans interacted and organisations operated. The Digital Revolution turned analog, electronic and mechanical devices into the digital technology available today. This process is still ongoing. The technologies that emerged during the Third Industrial Revolution include the personal computer, the Internet and Information Communication Technology (ICTs). Building on the Digital Revolution of the Third Industrial Revolution, the Fourth Industrial Revolution presents new ways in which technology becomes embedded, not only into society but also into the human body. The Fourth Industrial Revolution is characterised by cyber-physical systems to monitor, analyse and automate businesses.

The phases of industrialisation are summarised in Figure 1

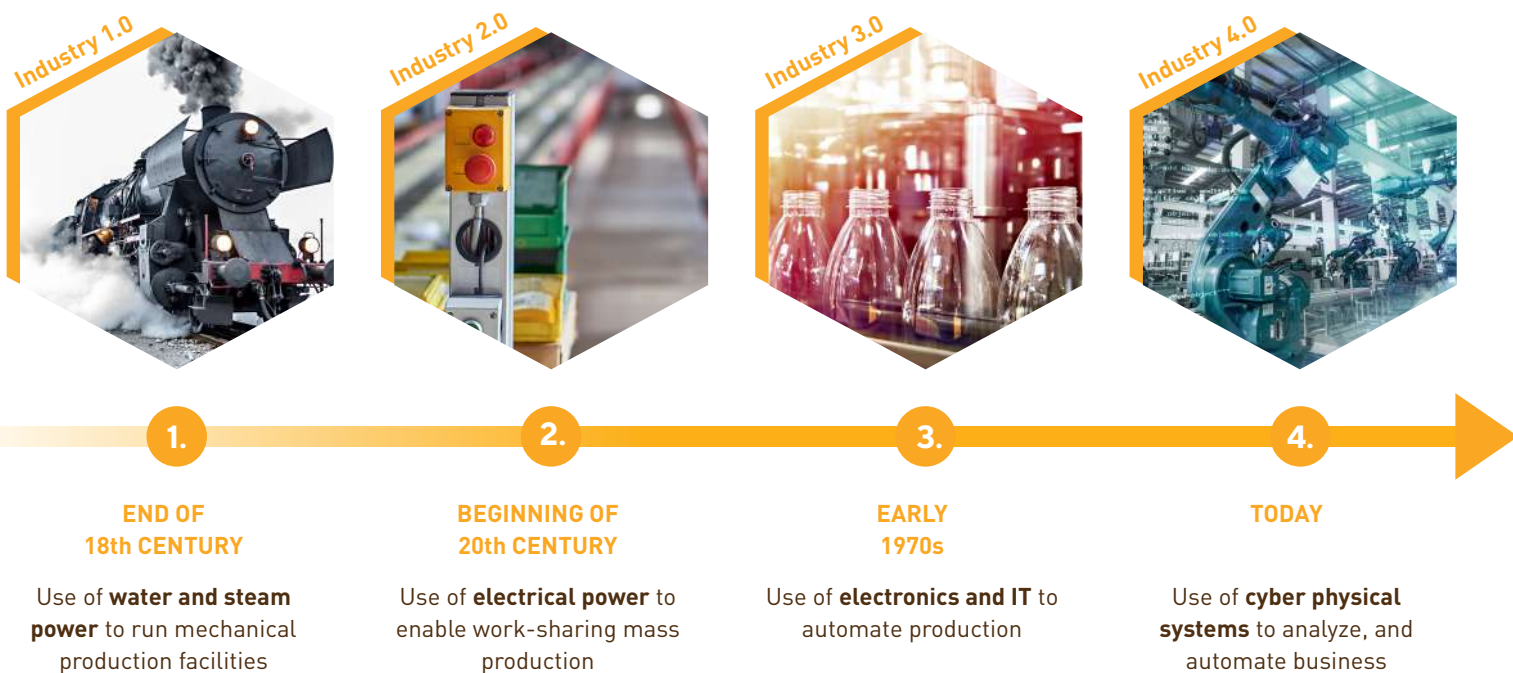




Figure 1: The four phases of industrialisation
 Source: Veza, Mladineo and Pek (2015)


It is important to note that what sets 4IR apart from the other phases of industrialisation is the multitude of technologies associated with the term. 4IR is not about advancing technology only, it is rather about connecting billions of people to the Internet and making businesses more effective and efficient. In this sense, 4IR consists of numerous technologies that have already changed the world of work irrevocably. Some of the prominent technologies included are explained below.




Artificial Intelligence
Involves the capacity for abstract, creative, deductive thought and the ability to learn using the digital, binary logic of computers




Quantum Computing
Computing that uses quantum-mechanical phenomena, such as superposition and entanglement




Machine Learning
A field of Artificial Intelligence that enables machines to improve their performance without being programmed to do so



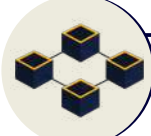
Automated systems
Sets of hardware and software that allow machines to function without human intervention




Robotics
Machines that substitute and replicate human actions



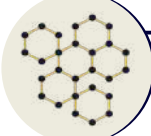
Biotechnology
Making products or technological applications involving living systems and organisms




Blockchain
Technology that is resistant to the modification of data. Data is stored as an open, distributed ledger that can record transactions between two parties efficiently, verifiably and permanently



Internet of things (IoT)
The network of physical devices, vehicles, home appliances, and other items embedded with electronics, software, sensors, actuators, and connectivity enabling the collection and exchange of data



Nanotechnology
The manipulation of atomic, molecular, and supramolecular matter



3D-printing
The various processes by which materials are joined or solidified under computer control to create three-dimensional objects

The various 4IR technologies imply that everybody and everything is networked and connected. The pictures below indicate some new field of work made possible by 4IR technologies (WEF, 2019):

EVERYBODY AND EVERYTHING IS NETWORKED



SMART LOGISTICS



HUMAN MACHINE INTERACTION



BUSINESS COMPUTING



MACHINE TO MACHINE INTERACTION



AUTONOMOUS SYSTEMS

NEW FIELDS OF WORK



SWARM ROBOTICS



TEAM ROBOTICS



SMART GRID



INTERNET OF THINGS



CAR 2 INFRASTRUCTURE



HUMAN RESOURCE REALITIES IN THE NEW WORLD OF WORK

Contemporary organisations need to contend with many challenges that have mainly been brought about by increased globalisation and the massive expansion of technology. These include the following issues:

- Skilled knowledge workers are an essential component of contemporary organisations, but there is increased competition for these in the global sphere;
- Increased diversity on all levels of the organisation means that soft skills development has become imperative, notably teamwork, inter-personal and inter-cultural skills;
- More virtual organisations implies that traditional organisational structures are being challenged, notably, authority, organisational structuring and leadership;
- Generation Y (millennials) and Z are entering the workplace. It is estimated that the global workplace already consists of 50% millennials;
- Engineering and IT is the future and a big emphasis is placed on these professions, especially in the context of 4IR.

Given these complex challenges, human resource professionals need to take cognisance of the following aspects:

- New skill sets need to be developed as employees need to work in a significantly more complex, interconnected, unpredictable and evolving environment;
- Traditional training models have become obsolete. Jobs skills are essential, not necessarily university degrees;
- Given that some jobs did not even exist ten years ago (e.g. app developer, cloud services specialist, social media manager, blogger), organisations need to plan for social and organisational reconfiguration: There are various debates about the types of jobs that will remain 15, 10 or even 5 years from now. The jobs that remain will, however, require thought, empathy, creativity and critical thinking. These skills cannot be automated;
- Talent management needs to be strategically conceptualised in order for organisations to adapt their strategies.

SOUTH AFRICA'S READINESS TO ADOPT 4IR TECHNOLOGIES



An assessment by the World Economic Forum (WEF) in 2019 indicates that, although South Africa's manufacturing share of GDP has decreased since the 1990s, it still has the strongest Structure of Production within Africa. While South Africa has good innovative ability and entrepreneurial activity supported by a sophisticated financial sector, human capital challenges remain a concern for the future of production. A shortage of engineers, scientists and digital skills was cited as problematic (TIPS, 2018).

The undermentioned table relates the scarce skills for South Africa in 2019:

Scarce jobs/skills for South Africa (2019)

- | | |
|--|---|
| 1. Network and information security | 11. Finance Manager |
| 2. Management skills | 12. Physical and Engineering Science Technicians |
| 3. Sales | 13. Industrial and Production Engineers |
| 4. Technologist | 14. Electrician |
| 5. Financial and accounting skills | 15. Chemical Engineer |
| 6. Electrical Engineer | 16. Analyst |
| 7. Civil Engineer | 17. Consultant |
| 8. Mechanical Engineer | 18. Recruitment |
| 9. Quantity Surveyor | 19. Project management |
| 10. Programme or Project Manager Finance Manager | 20. Development skills in: Java, Php, Software, Net and Web |

Source: Department of Employment and Labour (2019)

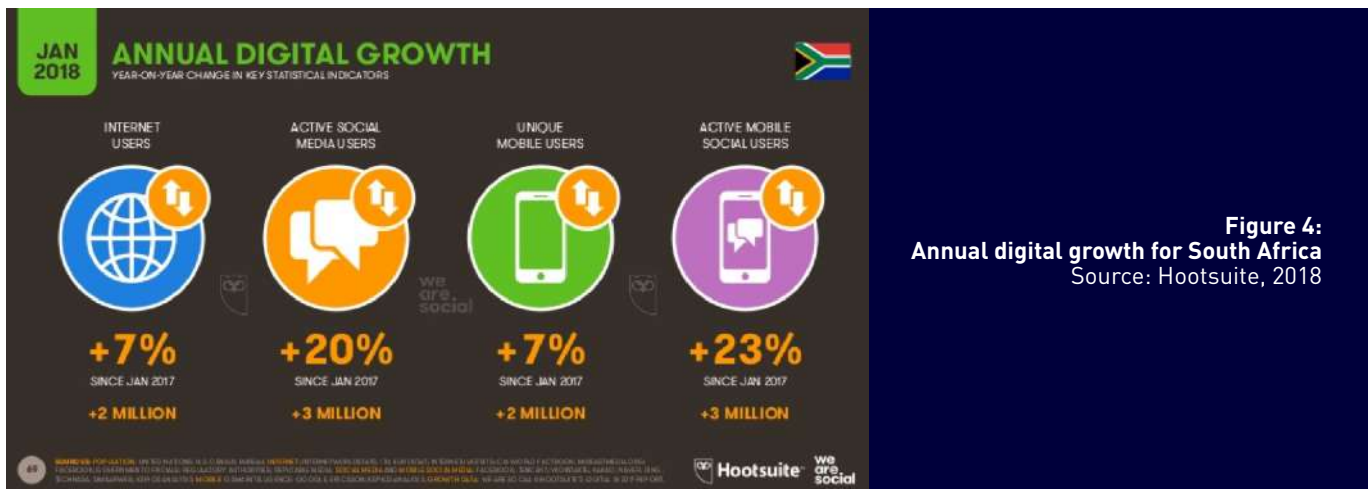
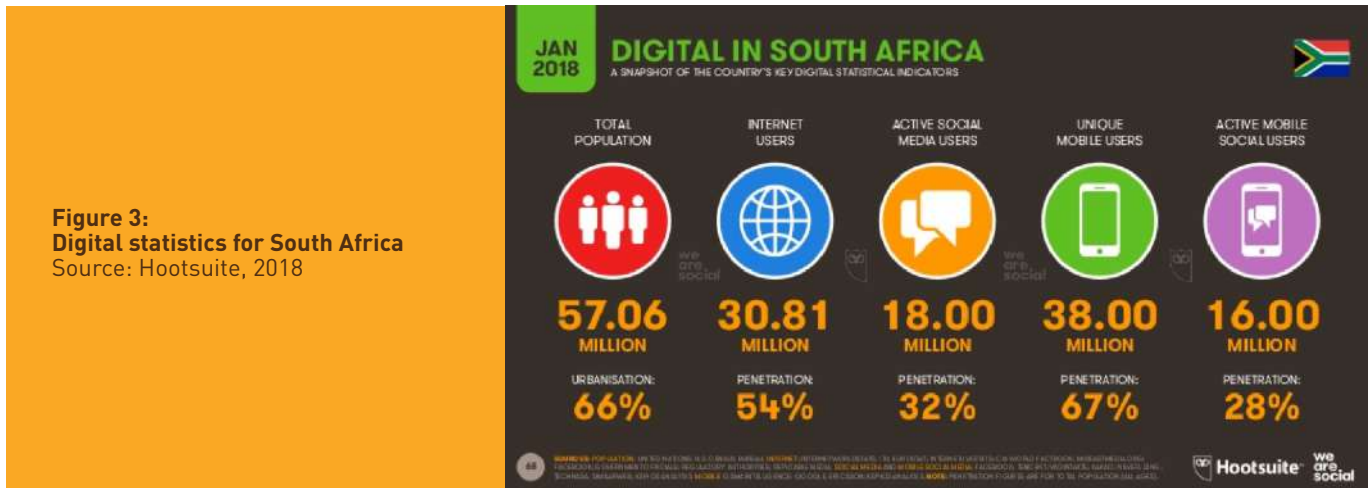
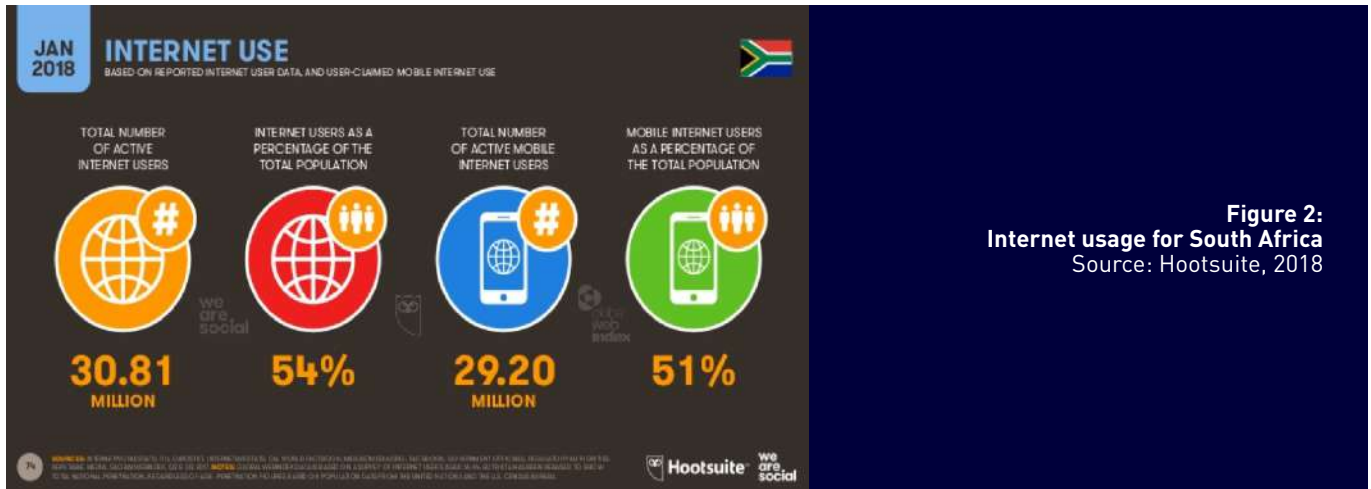
The scarce skills identified in Table 1 directly relate to the human capital needed for the adoption of 4IR technologies. The WEF report also cautions that technological advancement in some sectors may worsen the economic divide, which is a major concern.

An alarming finding made by World Wide Worx is that only 13% of corporate South Africa is using Artificial Intelligence, while a further 21% aims to adopt it in the next 12 to 24 months (World Wide Worx, 2019). Participants cited cost of adoption as a major stumbling block.

A report by Deloitte concurs that a lack of skills is problematic in the African and South African context, as well as connectivity and accessibility (Deloitte, n.d.).

FACT SHEET - NOVEMBER 2019

The undermentioned figures indicate the connectivity and accessibility pertinent in South Africa:



It is clear from the figures above that a lot still needs to be done to ensure all South Africans have access to the Internet and other forms of digital technology.

The Deloitte report further reports that the adoption of smart technologies is only at a foundational phase in South Africa. There is thus a big emphasis on African governments, especially in South Africa to create strategies and infrastructure that enables the adoption of 4IR technologies.



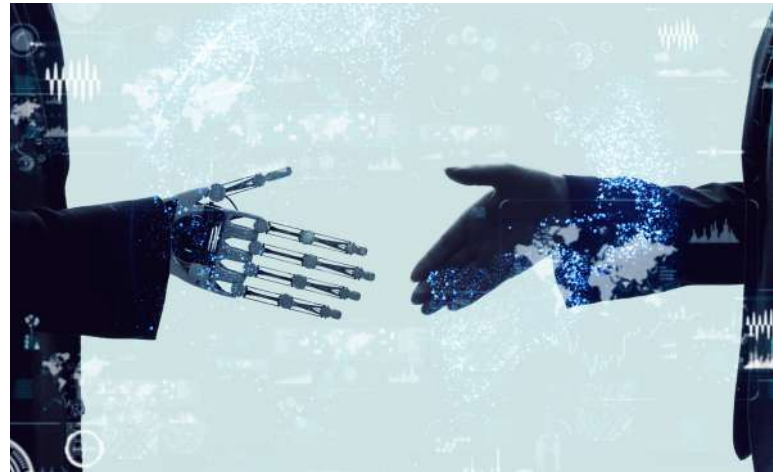
THE ROLE OF HUMAN RESOURCE PROFESSIONALS

Based on the above discussion, it is clear that human resource professionals have a pertinent role to play in being change agents for the future world of work. The following issues are relevant:

- Human resource professionals need to have good comprehension of the various 4IR technologies and how they are likely to impact on future talent management practices.
- Human resources professionals further need to have a macro view in terms of what is happening in the broader business context. They need to be well informed about trends and challenges that are likely to influence their organisation/industry/country. Having a silo mentality is not an option in the new world of work.
- Apart from managing the impact of massive technological change, human resource professionals also need to manage enhanced diversity on all organisational levels, which is a consequence of increased globalisation.
- In the face of massive technological change, human resource professionals need to provide stability and a people-centered approach, with a pertinent focus on developing the soft skills of employees to enable them to work in an augmented, interconnected and flexible environment.
- Human resource professionals need to guide managers and leaders to develop their own skills and abilities in accordance with new expectations.

CONCLUSION

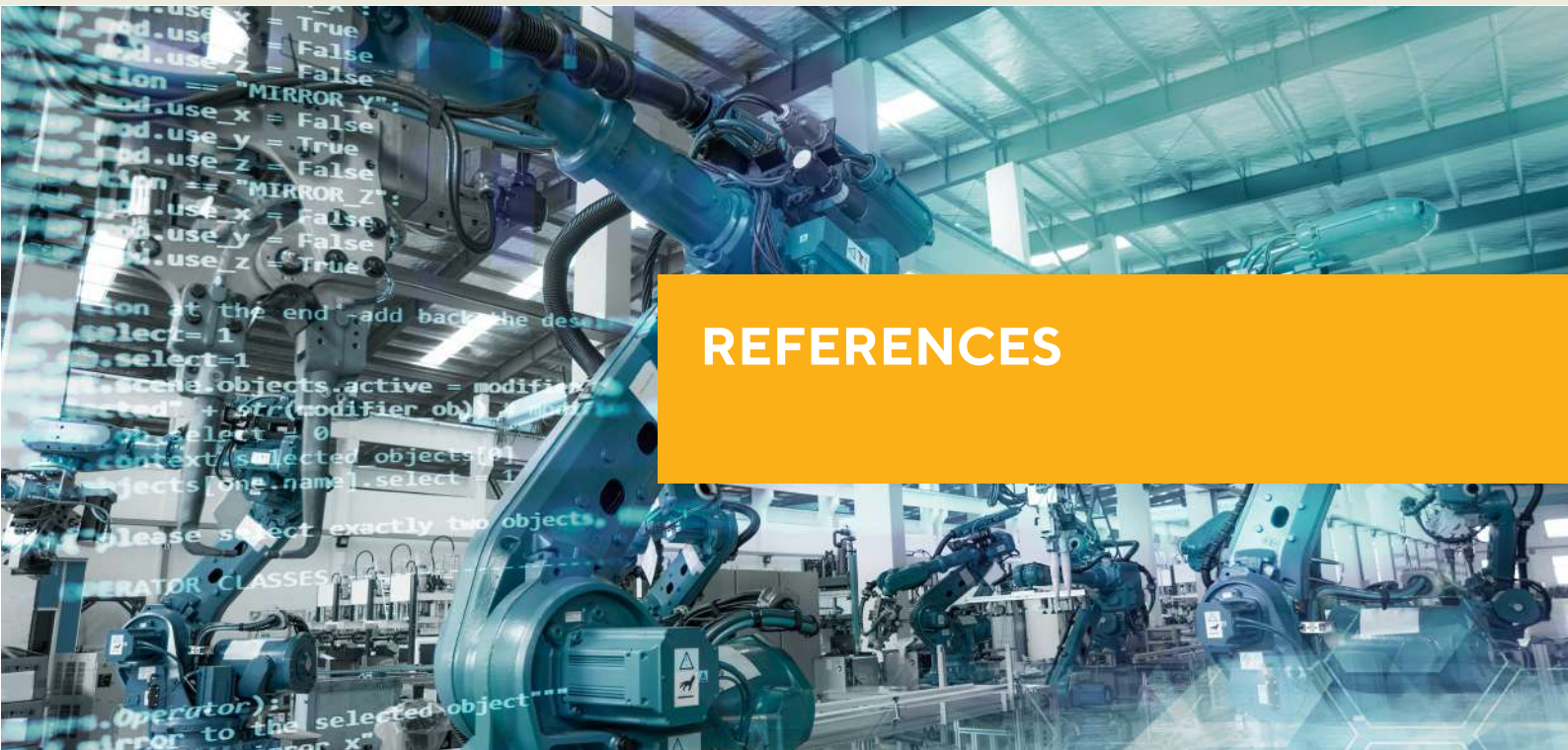
The paper delineated the meaning of 4IR and alluded to some of the major technologies associated with the term. Due to the pervasiveness of 4IR, there are far reaching implications for all industries in all countries, including developing countries like South Africa. The discussion clearly indicated two major challenges for South Africa in adopting 4IR technologies: human capital shortages and connectivity and accessibility constraints. These two factors are likely to hamper the country in competing in a highly challenging global environment. The paper also alluded to the role human resource professionals can play as change agents in paving the 4IR way.



This fact sheet was written by:
Deseré Koko

Associate Professor: Human Resource Management
Department of Business Management
Central University of Technology, Free State
Bloemfontein, South Africa
E-mail: koktd@cut.ac.za





REFERENCES

- Deloitte. (n.d). Industry 4.0: Is Africa Ready for Transformation? Retrieved October 10, 2019, from: <https://www22.deloitte.com/content/dam/Deloitte/za/Documents/manufacturing/za-Africa-industry-4.0-report-April14.pdf>
- Department of Employment and Labour. (2019). List of Scarce Skills in South Africa in 2019. Retrieved October 10, 2019, from: <https://briefly.co.za/26159-list-scarce-skills-south-africa-2019.html>
- Hootsuite. (2018). Digital in 2018 in Southern Africa. Retrieved October 10, 2019, from: <https://www.slideshare.net/wearesocial/digital-in-2018-in-southern-africa-86865907>
- Schwab, K. 2016. The Fourth Industrial Revolution: What it means and how to respond. Retrieved June 6, 2019 from: <https://doi.org/10.1080/0308569042000238082>
- TIPS. 2018. World Economic Forum and the Fourth Industrial Revolution in South Africa. Retrieved October 9, 2019, from: http://www.dti.gov.za/industrial_developments/docs/TIPS.pdf
- Veza, I., Mladineo, M. & Pek, I. 2015. Analysis of the current state of Croatian manufacturing industry with regard to Industry 4.0. Retrieved May 6, 2019 from: https://www.researchgate.net/publication/284719780_ANALYSIS_OF_THE_CURRENT_STATE_OF_CROATIAN_MANUFACTURING_INDUSTY_WITH_REGARD_TO_INDUSTY_40
- World Economic Forum (WEF), 2019. Retrieved October, 21, 2019 <https://www.facebook.com/fourthindustrialrevolution/>
- World Wide Worx. 2019. Fourth Industrial Revolution in South Africa 2019. Retrieved October 10, 2019, from: <http://www.worldwideworx.com/wp-content/uploads/2019/07/Exec-Summary-4IR-in-SA-2019-pdf>

FACT SHEET

DATE	NUMBER	SUBJECT
2016		
February	1	PRODUCTIVITY BASICS
March	2	SERVICE LEVEL AGREEMENT
April	3	TALENT MANAGEMENT: PAST, PRESENT AND FUTURE
May	4	BUILDING ORGANISATIONAL CAPABILITIES
June	5	CHANGE MANAGEMENT
July	6	INNOVATION IN HR
August	7	HR TECHNOLOGY
September	8	HR IN BUSINESS SUSTAINABILITY
October	9	THE LEARNING & DEVELOPMENT LANDSCAPE IN SA
2017		
February	1	MODERN SLAVERY
March	2	PENSION LAW FOR EMPLOYERS
April	3	THE GAME CHANGER: ROLE OF HR
May	4	HR GOVERNANCE
June	5	INTEGRATING SKILLS DEVELOPMENT, EMPLOYMENT EQUITY AND B-BBEE TRANSFORMATION
July	6	STRESS MANAGEMENT
August	7	REMUNERATION: RECENT TRENDS
September	8	HOW CEOs AND CHROs CAN USE THE SABPP TO CREATE EXCELLENCE IN HR MANAGEMENT
October	9	PEOPLE WITH DISABILITIES
November	10	RETRENCHMENT
December	11	THE SOUTH AFRICAN LEADERSHIP STANDARD

For more information about SABPP, visit our website www.sabpp.co.za or follow us on twitter @Sabpp1 for daily HR information

FACT SHEET

DATE	NUMBER	SUBJECT
------	--------	---------

2018

February	1	STRATEGIC HUMAN RESOURCE MANAGEMENT
March	2	BULLYING IN THE WORKPLACE
April	3	LISTERIOSIS AND FOOD SAFETY IN THE WORKPLACE
May	4	FLEXIBLE WORK PRACTICES
June	5	YOUTH EMPLOYMENT SERVICE
July	6	HR PRACTITIONERS AS EX-OFFICIO COMMISSIONERS OF OATHS
August	7	NATIONAL MINIMUM WAGE (NMW)
September	8	EMPLOYEE RETRENCHMENT
October	9	THE FUTURE OF YOUTH IN SOUTH AFRICA
November	10	BOARD EXAMINATIONS: A SIGNIFICANT STEP FORWARD FOR HR PROFESSIONALISATION
December	11	CHRONIC DISEASE MANAGEMENT: CANCER IN THE WORK PLACE

2019

February	1	EMPLOYER VALUE PROPOSITION
March	2	QUALITY COUNCIL FOR TRADES AND OCCUPATIONS
April	3	RECENT TRENDS ON REMUNERATION GOVERNANCE
May	4	THE PROTECTED DISCLOSURES ACT
June	5	HR SERVICE DELIVERY MODELS
July	6	CREATING A SPEAK UP CULTURE AT WORK
August	7	JOB PROFILES
September	8	ETHICS HOTLINE MANAGEMENT: BEST PRACTICE GUIDE FOR SOUTH AFRICAN EMPLOYERS
October	9	DISABILITY AND EMPLOYMENT: THE SABPP DISABILITY PROFESSIONAL PRACTICE STANDARD
November	10	FACING THE FOURTH INDUSTRIAL REVOLUTION: WHAT ARE SOUTH AFRICA'S CONSTRAINTS?