



## 4<sup>TH</sup> ANNUAL SADC INDUSTRIALISATION WEEK

*Research & Innovation to support Industrial Development and leveraging opportunities of Fourth Industrial Revolution*

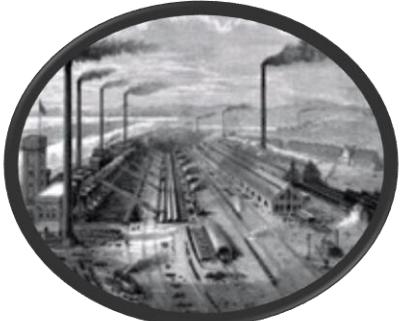
Dr Ndumiso Cingo

*Strategic Partnerships Manager  
CSIR, South Africa*

07 August 2019



## First “three” industrial revolutions



- **FIRST INDUSTRIAL REVOLUTION (~ 1765 to 1840)**
  - Steam Power
  - Rise of the Factory System
  - Machine tools, chemical manufacturing, iron production
- **SECOND INDUSTRIAL REVOLUTION (~ 1870 to 1914)**
  - Rapid industrialization
  - Electricity, telephone, rail
  - Increased inter-connectedness
- **THIRD INDUSTRIAL REVOLUTION (1970 to today)**
  - Rise of electronics
  - Microprocessors, telecommunications, automation

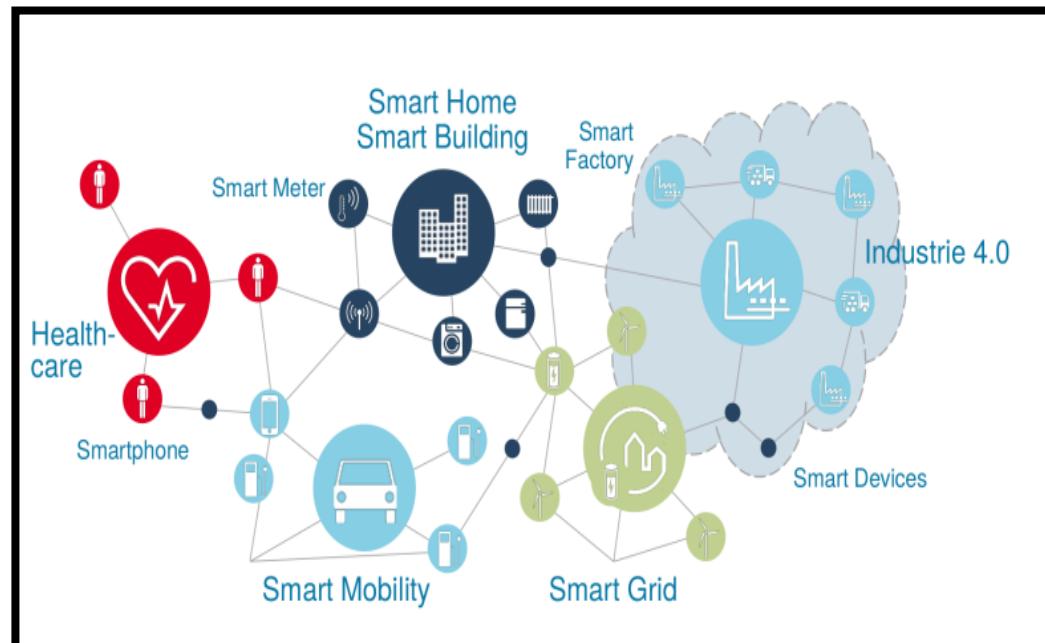


## The “Fourth Industrial Revolution”



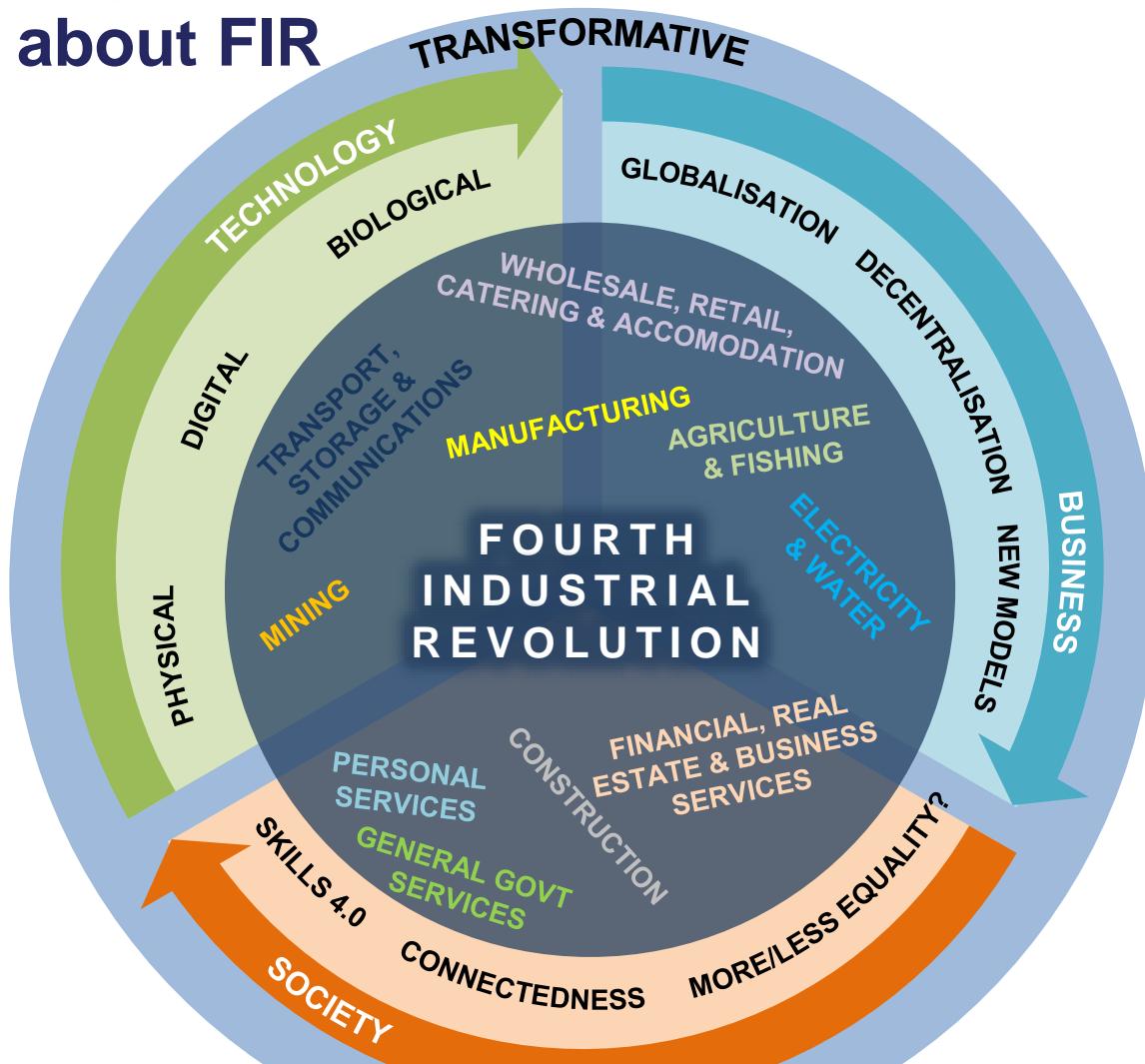
*The fourth industrial revolution refers to the fusion of technologies in the physical, digital and biological domains leading to the creation of new technologies that usher in a new industrial era characterised by accelerated growth, inter-connectedness, increased human productivity and the blurring of the lines between man and machine.*

# FIR is not just manufacturing.....



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# Shifting paradigms: A framework for thinking about FIR



## Technology Revolution??



Advanced Robotics



Big Data & Analytics



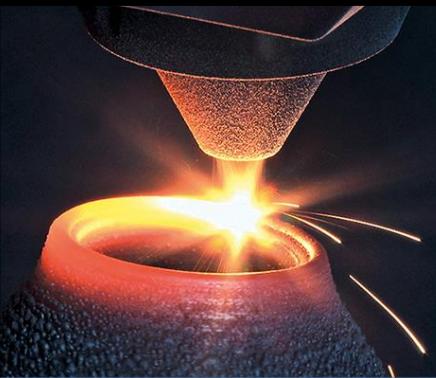
Big Data & Analytics



Augmented Reality



Digital Integration



Advanced Manufacturing



Cloud Computing



Internet of Things



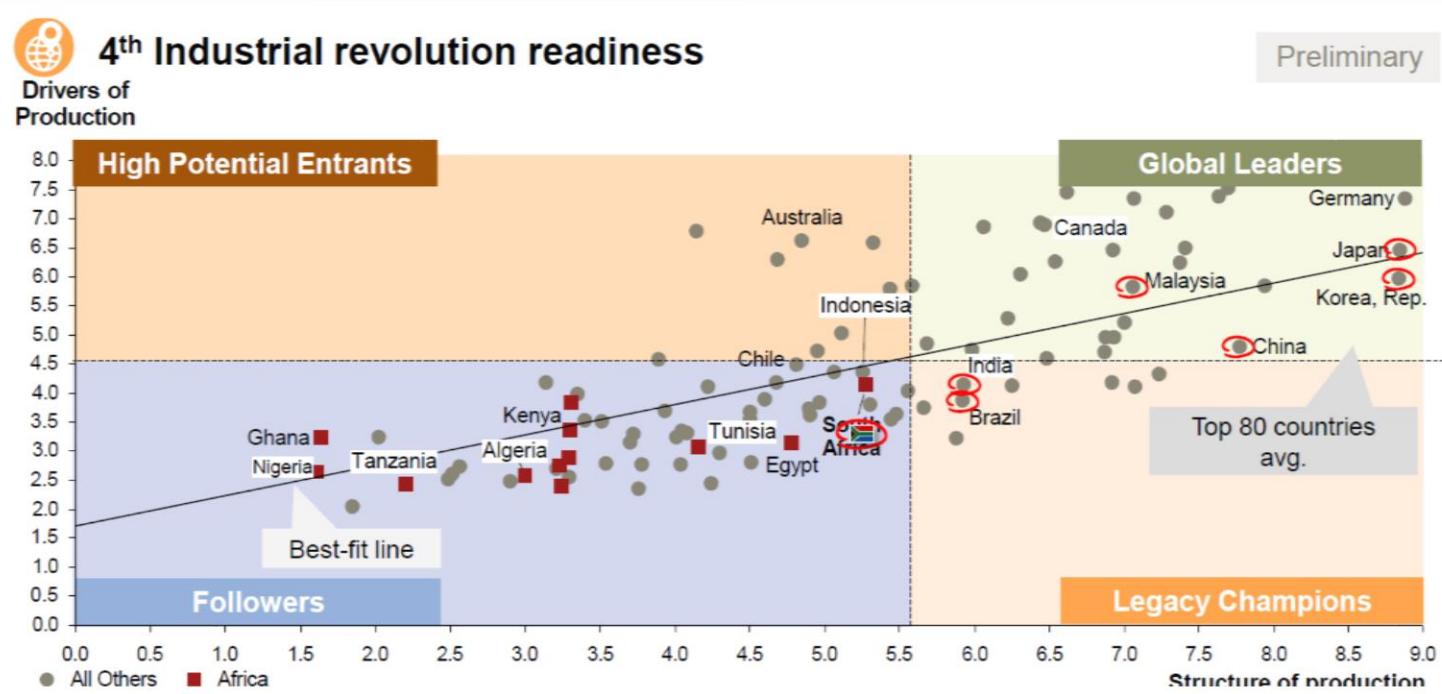
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## Global FIR Landscape

- The World Economic Forum (WEF) has developed a data-driven tool to assess country readiness or ability to capitalise on future production opportunities
- The tool assesses the maturity of a country's production system (complexity and scale of manufacturing base) and various drivers of production (innovation potential, resources, human capital and global trade and investment environment)

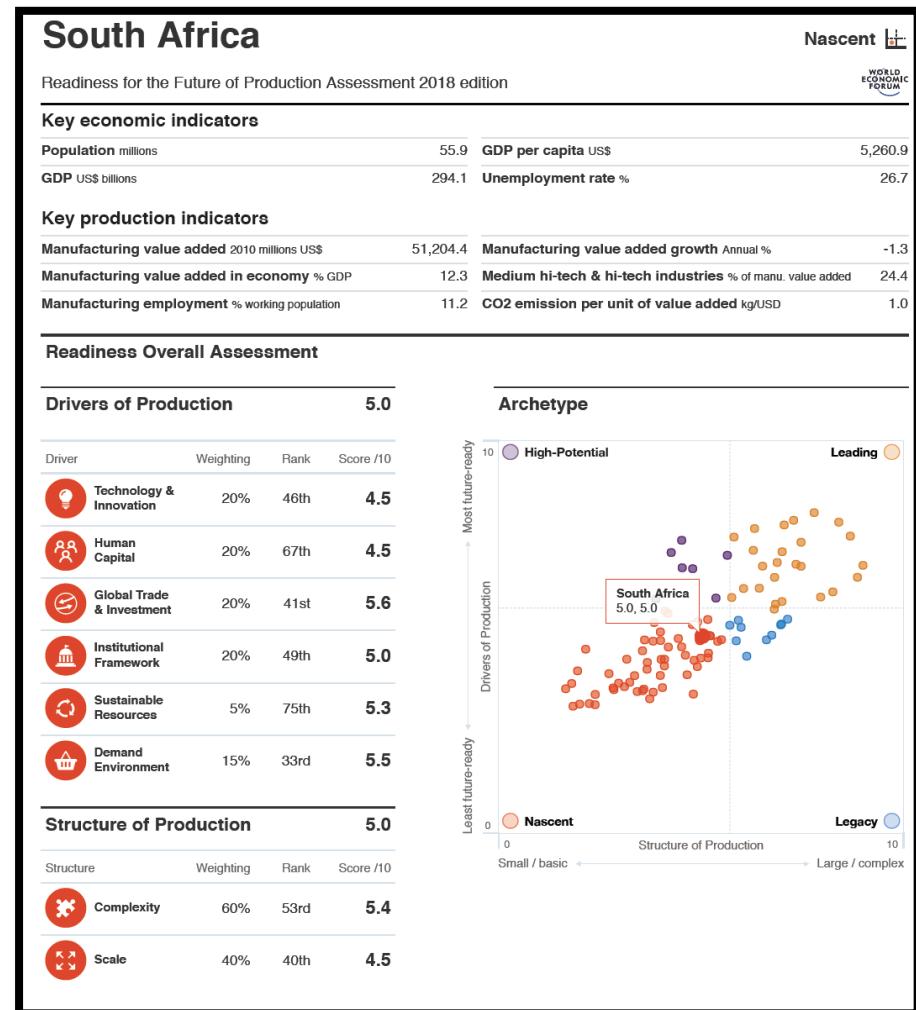


## South African Readiness Report

*“...we believe South Africa is at a crossroads. FIR can be embraced or risk industry falling further behind”*

- AT Kearney

- South Africa's manufacturing share of GDP has decreased to 12%.
- Strongest structure of production within Africa
- Ability to innovate is one of South Africa's greatest strengths
- Human capital remains the most pressing challenge
- Critical for SA to improve its institutional framework
- Stable policy environment
- Direct innovation effectively



## African context

- All of the 15 African countries assessed for production readiness (WEF, 2018) fell into the “Followers” category
- Compared to the rest of the world, the current adoption and impact of the FIR on the African continent remains low
- The biggest challenges in Africa remain digital skills, connectivity and accessibility
- More private and public investments and incentives are needed
- Africa has an advantage over the developed markets because it is not weighed down by infrastructure legacy issues and may have little difficulty in embracing change



De Loitte, “Industry 4.0. Is Africa ready for digital transformation”, 2016

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- Advanced materials (Nano/Alloys)
- Micro-nano electronics
- Industrial biotechnology
- Photonics
- Geoengineering
- Additive manufacturing (3D Printing)
- Advanced robotics
- Artificial Intelligence
- Neurotechnologies
- Space technologies



- Big data
- Predictive analytics
- Cloud computing
- Internet of Things
- Embedded linked sensors
- Augmented reality and wearables
- Blockchain
- Energy Capture, storage and transmission
- New computing technologies



## Key Institutional and System-wide elements



A conducive  
and  
supportive  
policy  
environment



State support  
instruments  
and incentives



Research,  
Development  
& Innovation  
Environment



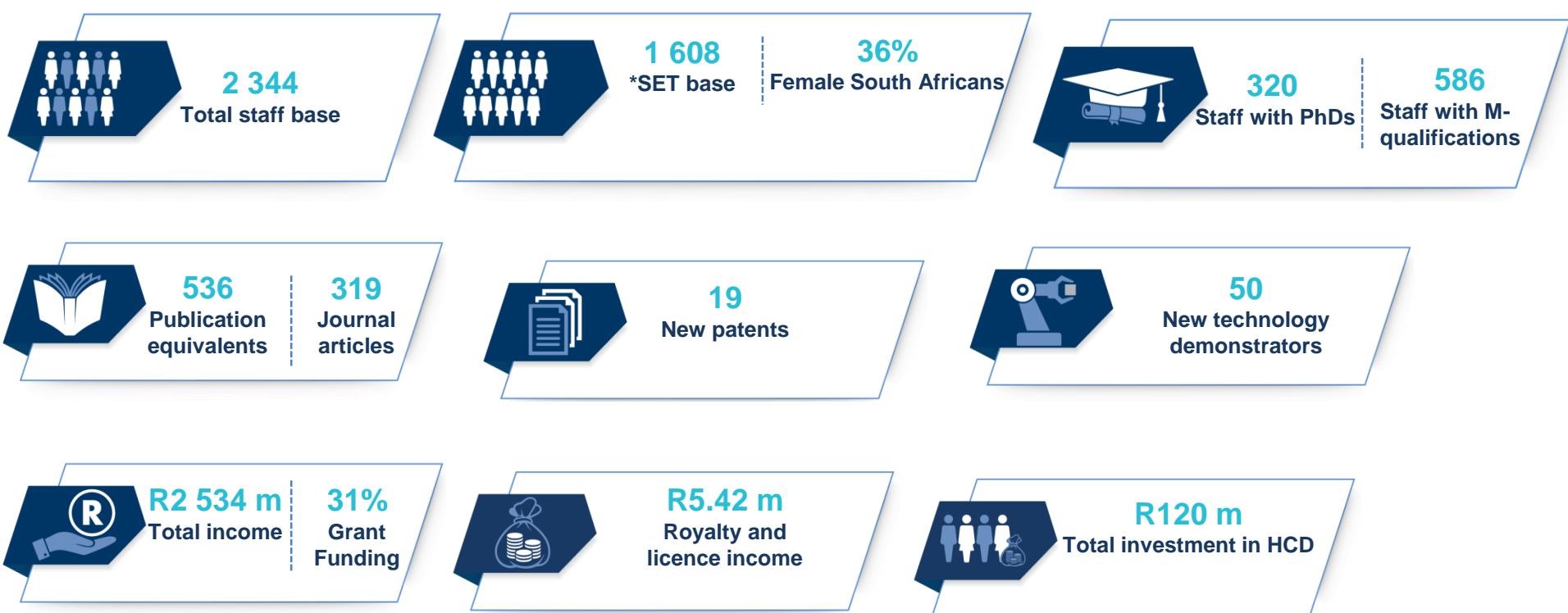
Public-private  
partnership  
models and  
instruments



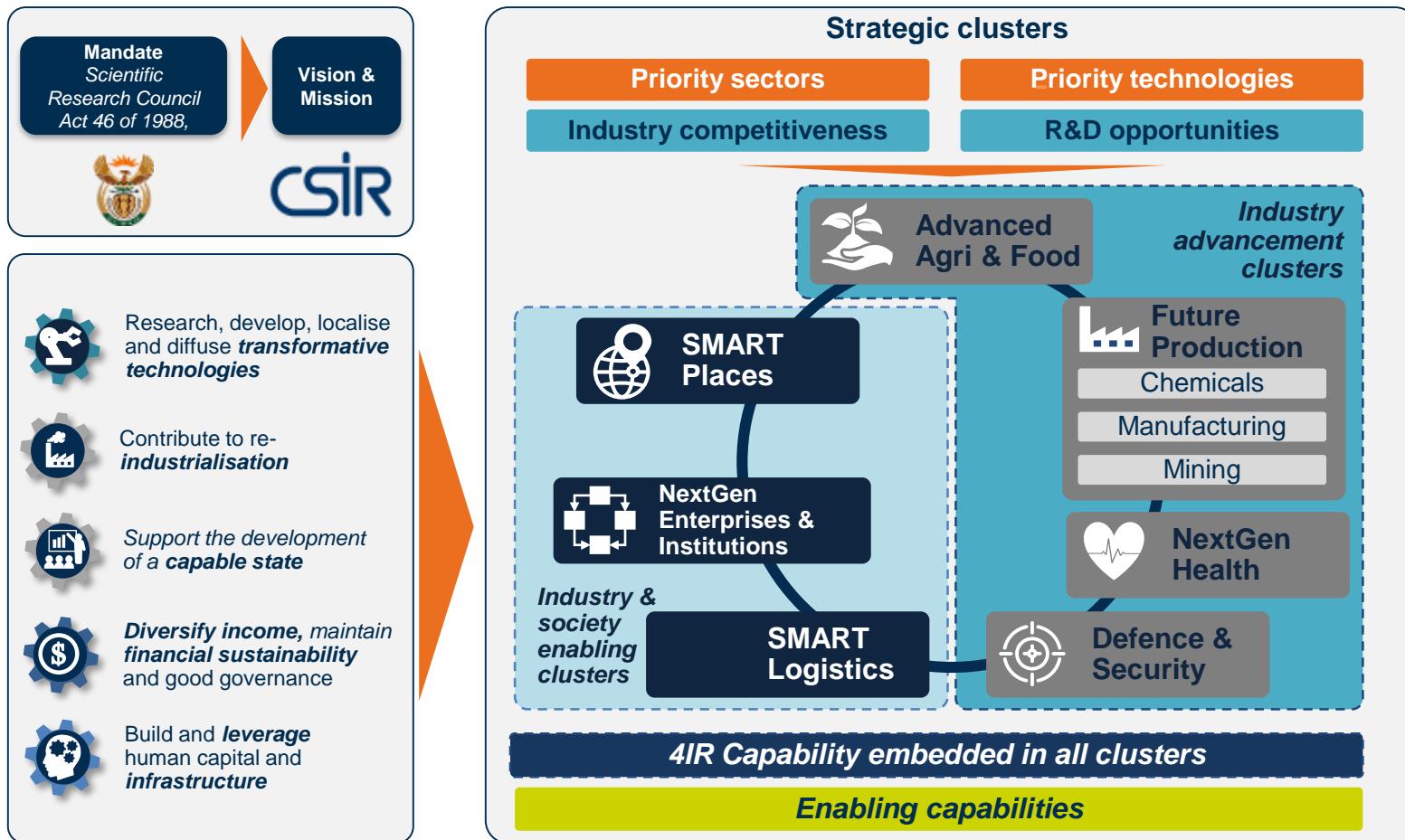
## The CSIR at a glance

The CSIR is a science council, classified as a national government business enterprise.

### IN NUMBERS:



## CSIR Strategy



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## INDUSTRY INNOVATION PROGRAMME



### BIDC

Translate biomanufacturing concepts and technologies into market-ready products and services

### BIDF

Developing, testing and adapting biorefinery technologies to South African biomass sources

### NIDF

Aimed at developing a nano-technology industry

### NMDMF

Integration of technologies in nano-micro device manufacturing

### PPF

Aims to facilitate the development of prototypes that satisfy market needs in the photonics industry

### Key objectives

- Enhance industry competitiveness: improve efficiencies, develop new products, shorten time to market, developing skills for industry, access to R&D infrastructure
- Leveraging industry R&D funding: encourage private sector investment into R&D, co-creation, and increase relevance
- Create jobs
- Investing in strategic R&D-led industrial development programmes

### Sub-programmes supported

- BIDC - Biomanufacturing Industry Development Centre
- NIDF Nanomaterials Industrial Development Facility
- BIDF - Biorefinery Industry Development Facility
- PPF Photonics Prototyping Facility
- NMDMF - Nano-Micro Device Manufacturing Facility



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## Up-scaling



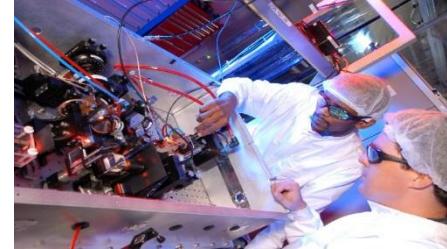
Vocational training



## Product development



Prototyping



## BIDF



## Access to State of the Art Facilities



NIDF



BIDC



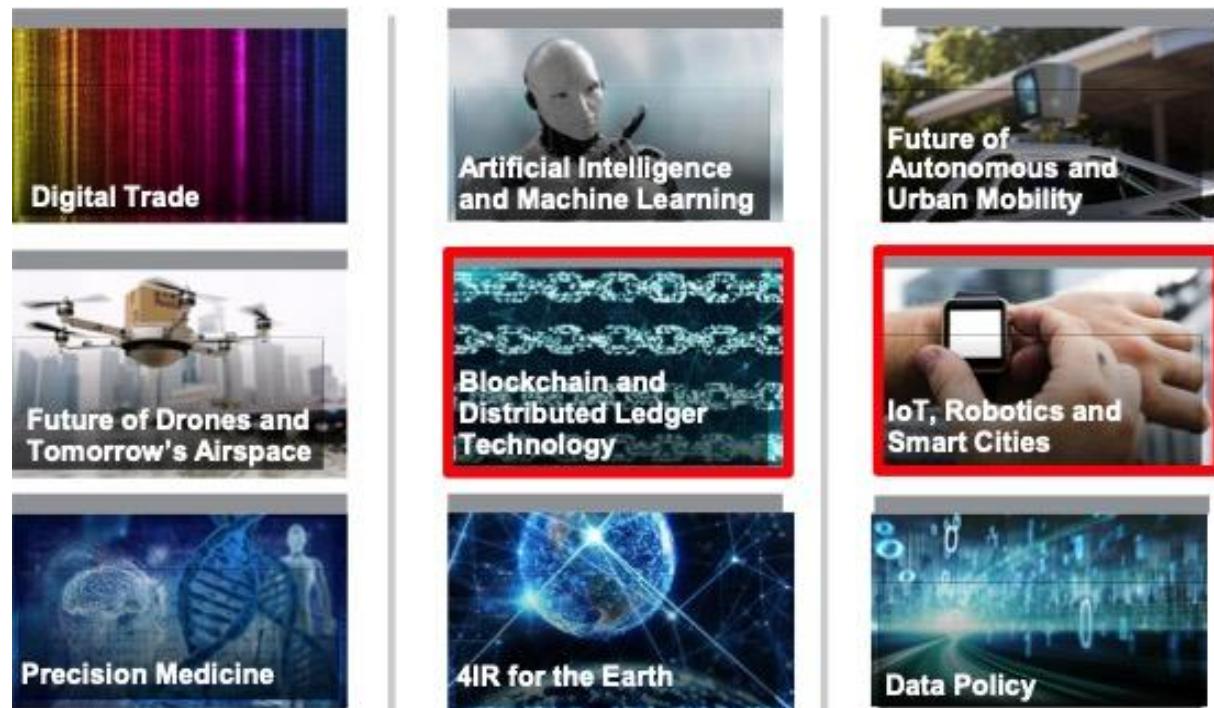
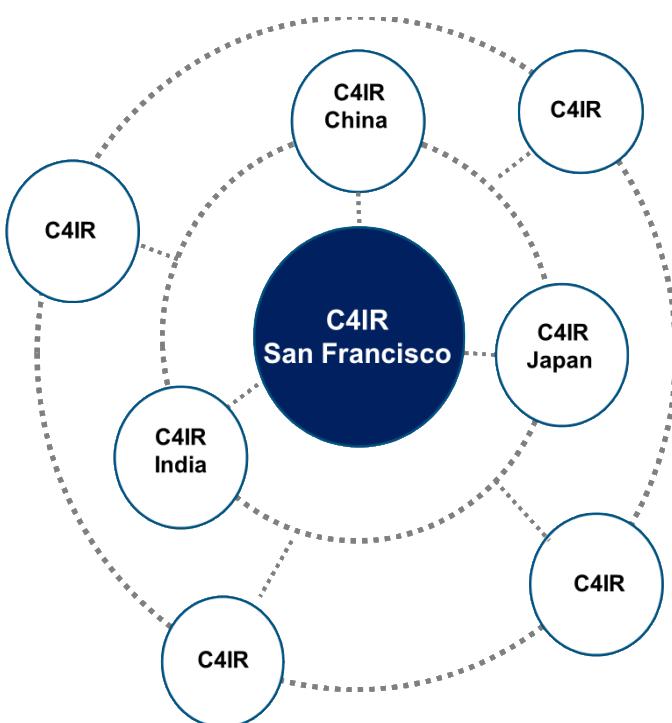
PPF

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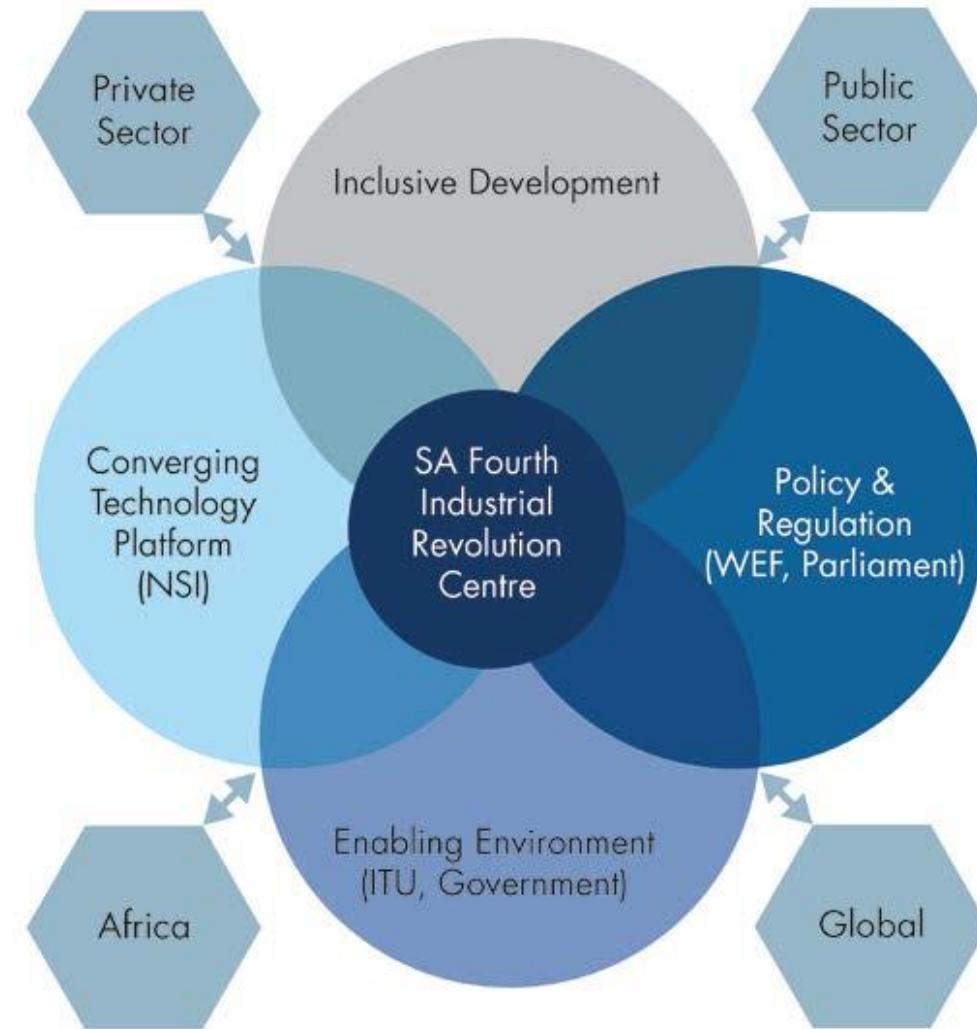
## African Centre for the 4th Industrial Revolution

Associate of the WEF C4IR global network

The Centre focuses on developing, piloting and scaling agile governance tools that can be adopted by policy-makers, legislators and regulators around the world. The Centre identifies pressing economic and social challenges that can be addressed in innovative ways using science and technology advancements.



## Regional Collaborative Networks



## Skills 4.0



### 1. Knowledge about ICT

- > Basic Information Technology knowledge
- > Ability to use and interact with computers and smart machines like robots, tablets etc.
- > Understanding machine to machine communication, IT security & data protection



### 2. Ability to work with data

- > Ability to process and analyze data and information obtained from machines
- > Understanding visual data output & making decisions
- > Basic statistical knowledge



### 3. Technical know-how

- > Inter-disciplinary & generic knowledge about technology
- > Specialized knowledge about manufacturing activities and processes in place
- > Technical know-how of machines to carry out maintenance related activities



### 4. Personal Skills

- > Adaptability & ability to change
- > Decision making
- > Working in team
- > Communication skills
- > Mindset change for lifelong learning

More Focus

Less Focus

## Workplace learning

*“The knowledge and skills that were relevant yesterday are no longer relevant today, and today’s knowledge and skills will be obsolete tomorrow.”*

On-Line Learning Platforms

Faster, Accessible Learning

Learning as a Benefit

Soft Skills



Collaborative Networks

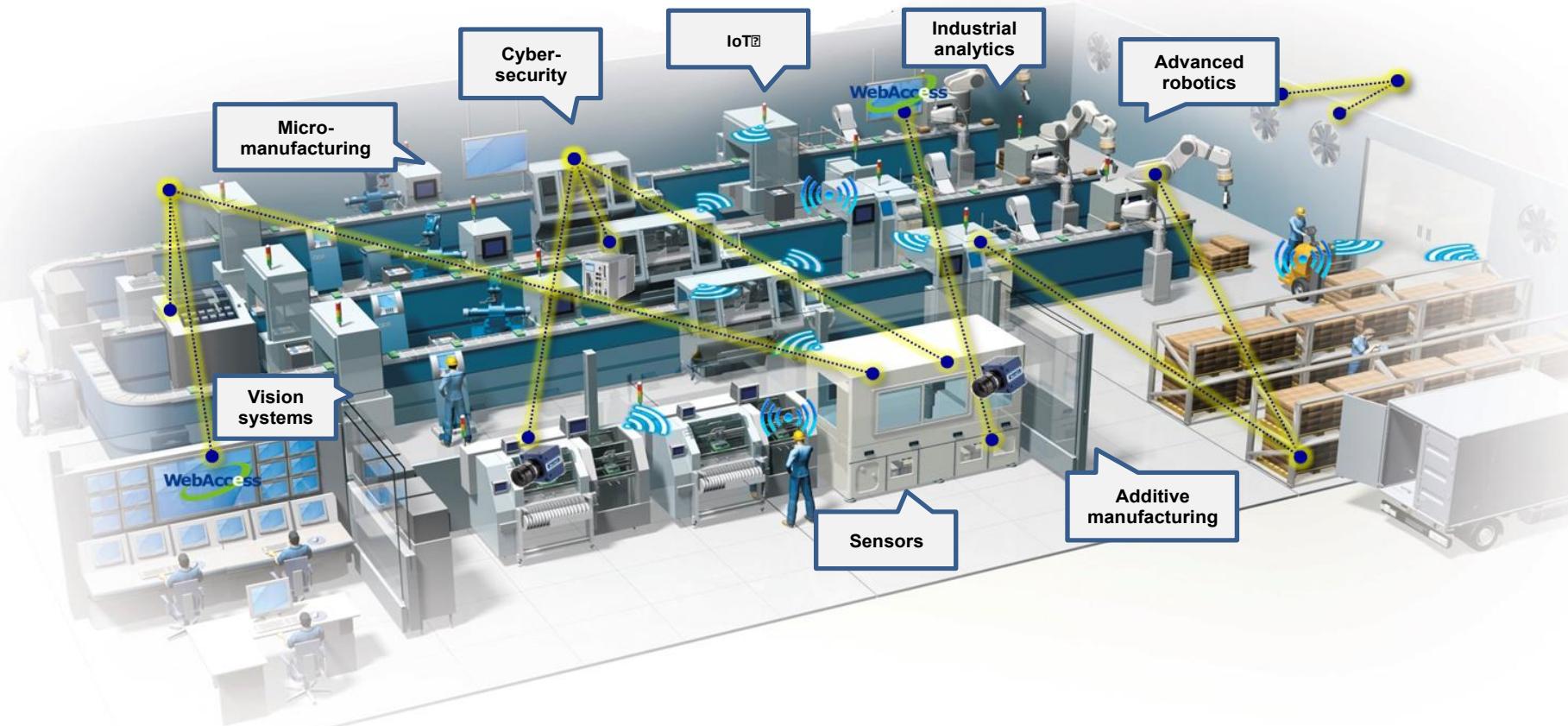
Virtual Learning Platforms

Learner Preferences

Future Readiness

*Continuing and rapid advancements in technology and automation have made it necessary for people to continually keep abreast of and adapt to the changes in order to stay relevant.*

## Learning Factories



Asante!  
Ndiyabulela!  
Thank you!



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