Innovation is accelerating to exponential levels by Catalytic Innovations e.g. Digitization/Digitalization

<table>
<thead>
<tr>
<th>Catalytic Innovations</th>
<th>In the past</th>
<th>Recently in the world</th>
<th>CSIR Potential Answers</th>
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<tbody>
<tr>
<td>Photography</td>
<td></td>
<td>Atmospheric water /</td>
<td>Water filtering technologies</td>
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<tr>
<td>Automobiles</td>
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<td>Desalination</td>
<td>Advanced sensor and optics</td>
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<td>Electricity</td>
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<td>Commercial Drones</td>
<td>HCD</td>
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<td>Airplanes</td>
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<td>Software developers</td>
<td>Software expertise development</td>
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<td>Telephones</td>
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<td>Mobile APPS</td>
<td>Micro sensors</td>
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<td>Trillion Sensor Future</td>
<td>3D printing design and materials</td>
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<td>3D printing</td>
<td>Breathalysers, Celnastic, Biomimetics</td>
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<td>Cancer Immunotherapy</td>
<td>LEDs (printed electronics)</td>
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<td>LEDs</td>
<td>Big Data Management</td>
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<td>Big Data</td>
<td>Internet of things (sensors)</td>
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<td>Internet of things</td>
<td>Natural Gas (materials research)</td>
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<td>Natural Gas</td>
<td>Wind Power Technologies</td>
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<td>Wind Power</td>
<td>Solar Power Technologies</td>
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<td>Solar Power</td>
<td>HySA (Advanced materials)</td>
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<td>Mass Energy Storage</td>
<td>Energy solutions</td>
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<td>Mass Energy Storage</td>
<td>Transport solutions</td>
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<td>Micro Grid Conversion</td>
<td>Materials synthesis</td>
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<td>Hyper speed transport</td>
<td>Autonomous vehicles</td>
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<td>Contour Crafted Houses</td>
<td>Advanced batteries</td>
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<td>Driverless everything</td>
<td>Bio manufacturing</td>
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<td>Electric everything</td>
<td>Learnership program</td>
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<td>Bio Factories</td>
<td>Smart device management</td>
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<td>Micro Colleges</td>
<td>Drones and robotics</td>
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<td>Smart Homes/buildings</td>
<td>Robotics platforms and</td>
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<td>Home Delivery</td>
<td>Pharmacy Automation</td>
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<td>24 Hour Cities</td>
<td>4th Industrial Revolution</td>
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<td>Senior Living</td>
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Industry 4.0
- Cost Control/ efficiency
- Competitive Positioning
- Production capacity/ Flexibility
- Improved client service
- Monetizing the value chain

Cyber Physical Systems
- Internet of Things
Technologies changing the face of Manufacturing

Advanced materials (Nano/Alloys)
Micro-nano electronics
Industrial biotechnology
Photonics
Additive manufacturing
Advanced robotics
Intelligent machines

Big data
Predictive analytics
Cloud computing
Embedded sensors
Augmented reality
Internet of Things
Industry 4.0
A key driver for Re-Industrialisation is that the barriers for entry into manufacturing are becoming lower (democratization of manufacturing).

Manufacturing tools have become smaller and less expensive, democratizing access to sophisticated design and tooling capabilities for use in prototyping.

**Future**
- Makerbot 3D printer
- Voltera circuit printer
- Othermill CNC machine
- uArm miniature industrial robot

**Current**
- Injection molding machine
- PCB board factory
- Traditional CNC machine
- Traditional industrial robot

Source: Centre for the Edge, Deloitte University Press
Possible Role Models of High Tech Companies in USA and China

Dexmo

Local Motors
Industry 4.0 in a ‘nutshell’

Source: Roland Berger
Product Life Cycle Management as a key enabler
The CSIR National Industrialisation Support Initiative connects local and global industry and industrialisation partners.
Partnerships in SA manufacturing/industry ecosystem

A revitalized manufacturing industry requires specialized partnerships focused on deliberate execution

- **High** growth potential in select industry verticals to enable the creation of South African OEM’s in globally relevant market sectors;
- **Constant Innovation** to convert new ideas backed by future-relevant R&D to rapid and effective commercialisation
- **Effective implementation** within existing regulatory frameworks to accelerate societal, financial and environmental impact;
- **Specialised** contributions within clearly delineated partnerships across all six ecosystem domains;
- **Holistic** approach to global relevance through deliberate development of a competitive ecosystem
Compostable cup

PO₄³⁻
SO₄²⁻
Cr⁶⁺
NO₃⁻
F⁻
BPA
COD

From Materials To Product

From Materials to Products

CSIR
our future through science
Technology Convergence & Integration

Specialist devices

- Advanced sensors
- Advanced materials
- Design/ergonomics
- Additive manufacturing
- Microelectronics
- Photonics

Next generation Inspection System
- Internet of Things
- Miniaturisation
- Augmented Reality
- Others?

CSIR
our future through science
Health Point of Care

**Societal Challenges**

Effective timely detection and diagnostic systems

**Real-time Avian Flu Test**

Advanced materials

Microelectronics

Nanotechnologies

Photonics

Biotechnologies

DNA

Optical detection

Biochips

Fluidics
AIRBNB TECH STACK ANALYSIS

How to build the world’s largest “hotel” business, without any rooms!

20
Application & Data

16
Dev Ops

13
Utilities

8
Business tools

7 of 57 apps are (slightly) proprietary!