A strategic perspective on leading global technology developments in pursuit of digitalisation for industrial development

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Looking into the future as an inexact Science…

Don’t look for ideas to confirm your thinking, rather look for trends that will disrupt your thinking.

Rich Simmonds // SavvyCleaner.com
4th Industrial Revolution: Change in Industry and Society

1st
- Mechanization, water power, steam power

2nd
- Mass production, assembly line, electricity
- Capitalism, Systems & Consolidation
- Information Technology

3rd
- Computer and automation

4th
- Cyber Physical Systems
- Digital changes to Industry and Society

2nd Revolution with lasting impact on Industrial Development
2nd Revolution: Laying of the world-view we know today

**Before 2nd Industrial Revolution:**
- More direct relationship between supplier and buyer
- Craftsmanship as driver / limitation of production
- Capital – although limited – spread across society
- Large-scale capital not as critical for business growth
- More localised production / supply of goods & services

**After 2nd Second Revolution:**
- Value Chains mostly dominated by large Organisations
- Production driven by high volumes and low cost
- “Capital(ist) class” owns majority of assets / wealth
- Large-scale capital needed for large-scale business
- Globalisation of supply & demand

Large-scale Steel, Agriculture & Textile mills
Large-scale factories focused on economies of scale
Large-scale Electricity and Oil
Advances in Transportation
Separation of Labour and new business organisations

Mass production, assembly line, electricity
Challenge: Managing Disruption and Industrial Development

How to manage Industrial Development in an age of Disruption?

- Market
- Society
Reality: Disrupted World requires new Paradigms for success

Population of 9 - 10 billion by 2050

Global Warming

Human Migration & Urbanization

Trade Wars & Tribalism

Digital Unemployment

Wealth and Age Disparity

Massive Change Drivers

Carbon Tax for Transport

Social / Political upheavals

Review of 2nd Industrial Revolution Principles critical

Expanded *globalization* – although flawed - is the only way for growing future prosperity

**Large global companies** are key to getting things done and raising huge capital requirements

Fighting *Climate change* is not critical (yet)

Profit maximization *trumps* sustainability

*Wealth disparity* is a unavoidable by-product of our times and protectionism is always bad

It’s possible to just *add Technologies* - without fixing the major flaws of our current World
2nd Revolution: Increasing challenges into sustainability

But now, the very affluent (the 99.999th percentile) see the largest income growth.

The poor and middle class used to see the largest income growth.

Source: New York Times
### Two Disruptive Industrial Development Models evolving

<table>
<thead>
<tr>
<th><strong>4th Industrial Revolution as Game Changer</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Networks to allow for people, machines and systems to <strong>communicate and interact</strong> anywhere</td>
</tr>
<tr>
<td>Digitization of physical Systems always for massive elimination of <strong>waste and inefficiency</strong></td>
</tr>
<tr>
<td><strong>Connecting parties</strong> previously limited by distance, time, trust and inter-compatibility</td>
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<tr>
<td>Supporting the pooling and interaction of <strong>innovation and collaboration</strong> as never before</td>
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<tr>
<td>Allowing Technologies (AI, exoskeletons, etc.) to support with <strong>human- and societal challenges</strong></td>
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</tbody>
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#### 2 Categories of Industrial Development going forward

**Largely dictated by Market forces:**
- Industry drives
- Regulations / Industrial Policy monitors, enables and restricts as needed

**Strategic coordination and collaboration** required by State and other stakeholders:
- Technologies evolve
- Active pursuit of opportunities
- Maturing of Technologies
Category 1 Industrial Development: *Market-driven*

Largely dictated by *Market forces*:
- Industry drives
- Regulations / Industrial Policy monitors, enables and restricts as needed
Market Focus: Smart Connected Products & Enterprises

Profit as Primary Driver

Cloud
Robotics
Mixed Reality
Artificial Intelligence
BlockChain et al

Machine to Machine (M2M)
Internet of Things (IoT)
Internet of Everything (IoE)

2 Primary Digitally enabled Industry 4.0 Beneficiation Models (today)

Smart Connected Products
Examples: Smart Home, Smart City, Smart Vehicle

Smart Connected Enterprise/Processes
Examples: Smart Supply Chain Management
Market focus: Improvements through integrated Digitization

1. Establish a Digital Twin of “Things”
   Capture information from the physical world to create a digital replica of the physical attributes critical to performance

2. Analyse, visualise and action
   Machines exchange data and information, allowing for real-time performance monitoring, visualization and intervention of key events

3. Optimise Dynamic Man-Machine-System
   Use of algorithms, AI and other technologies combined with optimal Man-Machine interfaces to improve processes and use of information

4. Deploy other Technologies as needed
Industry Case-study: Quick realisation as new reality

Working Solution within 10 working days incl. AR / VR
Market impact: Massive benefits from Industrial IoT

How manufacturers can realize commercial value from the Internet of Things

- $999 BILLION extra customers
- $810 BILLION reduced time to market
- $675 BILLION reduced costs
- $729 BILLION eliminating waste
- $675 BILLION greater labor efficiencies

27% of Total IOT Benefit of $14 Trillion until 2022
Strategic coordination and collaboration required by State and other key stakeholders:

- Technologies evolve
- New opportunities arise and have to be actively pursued
- Technologies have to be matured and adapted to allow for optimal deployment
Collaboration Focus: Linking sustainability to New-age Tech

United Nations 2030 Sustainable Development Agenda

Multi-stakeholder Industrial Policy Alignment required to achieve optimal Results

Disruptive Technologies as key enablers

Source: UN.org
Emerging Disruptive Technologies with potential to support Sustainable Development

New possibilities and pressure to achieve...

- Decentralized, dispersed and Peer-to-peer Value Creation
- Combining environmental protection with holistic economic beneficiation
- Increased access to economy through disruptive Technologies
- Reduction of wastage & pollution of Supply Chains / globalization
- More equitable distribution of income and broader capitalism
- Conversion of technology-enabled Savings for societal benefits

Disruptive Technologies with massive potential for SA
Opportunity: 3D-Printing for increased local value addition

<table>
<thead>
<tr>
<th>Localised 3D Printing</th>
<th>3D Printing Hubs</th>
<th>Industrial</th>
<th>Private</th>
<th>Food &amp; Specialist</th>
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- Establishment of **Network of 3D Printing Hubs** for local production
- **Alternative** to export raw material and importing of finished goods
- Maximization of local value add and **job retention / creation**
- **Collective access / usage** of equipment and Printing “Files” for shared benefits
- Linkage to **Re-cycling** of existing Materials as additional element
Opportunity: Broad-based Energy Production & Value addition

Distributed Energy System

<table>
<thead>
<tr>
<th>Central &amp; De-central Production</th>
<th>Distribution Network</th>
<th>Peer-to-Peer Market</th>
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- **Fundamental re-think of responsibilities for Energy Production:**
  - **Utility** = Network maintenance, power gap closure and coordination
  - **Energy user and supplier** = generation and exchange/sale of power
  - Broad **community participation** in economy through power generation
- **Micro-loans** to fund Asset investments
- **Purchase guarantee** as key instrument
Opportunity: Industrial IoT Service Delivery & Waste reduction

- **IoT-based Public Service Delivery**
  - **Connection of all key “Things”**
  - **“Waste” & Utilization Detection**
  - **Integrated Service Delivery**

- **Application of Industrial IoT principles** for improved Service Delivery: Connect, Analyse, Act and Improve
- **Customisation of “Smart City” concept for SA realities and challenges**
- **Integration of different silo-driven elements through Network Technology and AI for bridging Service gaps**
- **Ploughing back** of operational savings for lower rates and more investments
Opportunity: Localised Agriculture and Resource Re-cycling

<table>
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<tr>
<th>Agriculture &amp; Water protection</th>
<th>Food Value Chain</th>
<th>Sanitation Value Chain</th>
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<tbody>
<tr>
<td>Use of available urban space</td>
<td>Primary production</td>
<td><img src="food_value_chain.png" alt="" /></td>
</tr>
<tr>
<td>Pesticide-free and new energy farming</td>
<td>Processing → Transport → Food service</td>
<td><img src="sanitation_value_chain.png" alt="" /></td>
</tr>
<tr>
<td>Water “re-cycling” and -harvesting</td>
<td>Market</td>
<td><img src="vertical_at-demand_farming.png" alt="" /></td>
</tr>
<tr>
<td>Water Harvesting and at-Location Re-usage</td>
<td>Water Purification</td>
<td><img src="complex_compound_breakdown.png" alt="" /></td>
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<tr>
<td>Complex Compound Break-down</td>
<td>Advanced Materials Recycling</td>
<td><img src="incentivization_plastic_break_down.png" alt="" /></td>
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- **Reduction of logistics-intensive Farming** and optimal use of urban space
- **Creation of new supplier-buyer relationships** to support new business
- **Focus on grey-water** for load reduction on fresh water with incentives to save
- **Creation of market-place** for collection and “selling” of fresh water
- **Incentivization of Plastic Break-down**
- **Optimal integration** of all elements
Disruptive SA Industrial Development: Need for Game-Plan

**4th Industrial Revolution / Technologies as Game Changer**

Largely dictated by *Market forces*:
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**Strategic coordination and collaboration** required by State and other stakeholders:
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**Game-plan**

- Process to follow
- Parties required
- Commercial Model
- Role of Strategy & Innovation Players
Disruptive SA Industrial Development: Concept Game-Plan

SA Opportunities

- Strategize and assess potential for new-age Ind. Development
- Establish and monitor multi-factor gap to realisation
- Research, test and industrialise solutions to close gaps
- Integrate solution and test in real-life environment
- Build governance model and implement

Emerging Technologies

- 3D Printing
- Advanced Materials Recycling
- Renewable Energy
- Blockchain
- Digital Platform
- Water Purification
- Urban Farming
- Mixed Reality Learning
- Drones
- Robotics
- New Age Commerce
- Artificial Intelligence

Technology Adoption

- "THE CHASM"
- “INNOVATORS "TECHIES"”
- “EARLY ADOPTERS "VISIONARIES"”
- “EARLY MAJORITY "PRAGMATISTS"”
- “LATE MAJORITY "CONSERVATIVES"”
- “LAGGARDS "SKEPTICS"”

Government
CSIR & Academia
Industry & NGOs
Strategy experts
Funders et al