NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Office of the Vice-Chancellor

# Catalysing Youth Empowerment for the Fourth Industrial Revolution

Tjama Tjivikua
*Founding Vice-Chancellor*

Wednesday, 16 January 2019

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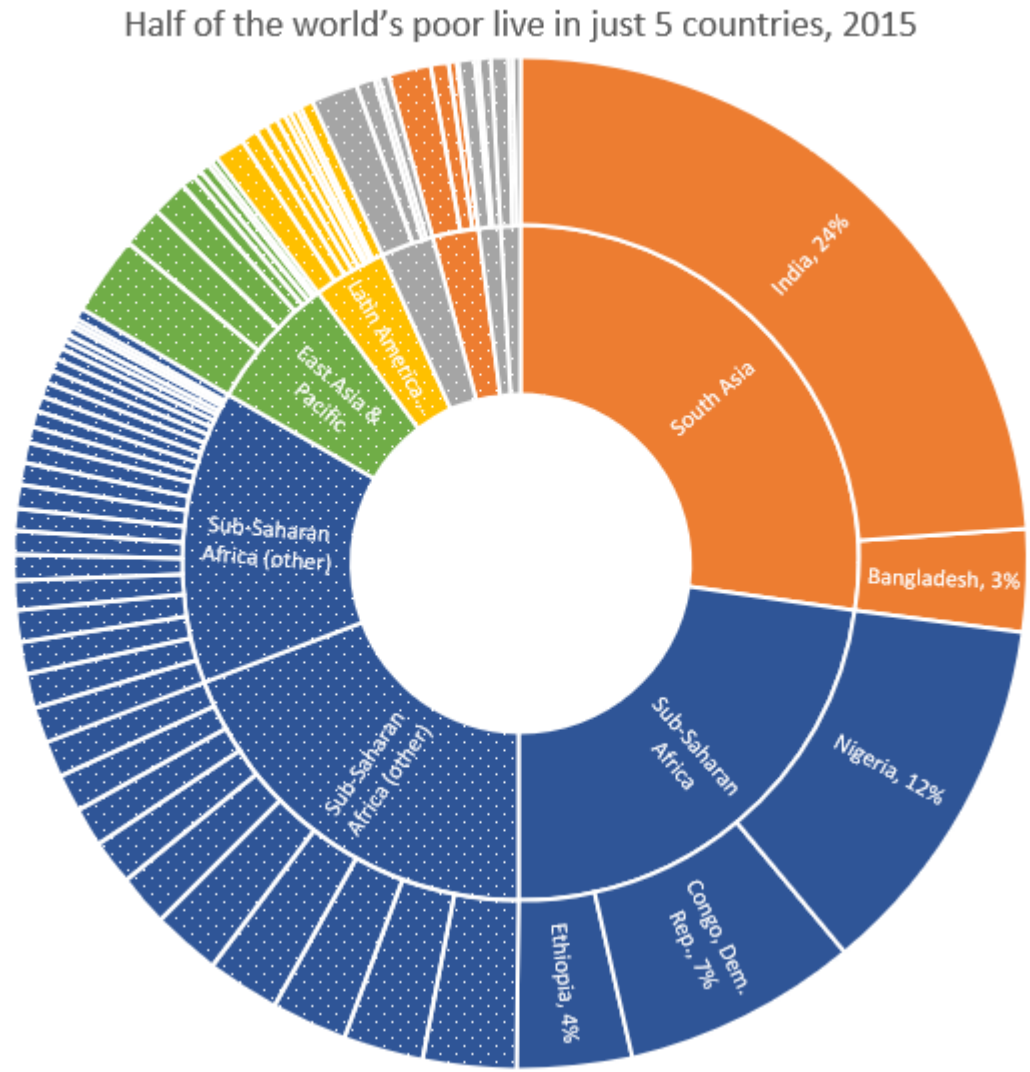
## Office of the Vice-Chancellor

Half of the world's poor live in these 5 countries:

🇮🇳 India
🇳🇬 Nigeria
🇨🇩 Democratic Republic of Congo
🇪🇹 Ethiopia
🇧🇩 Bangladesh

http://wrld.bg/Q8Mj30ngOcJ
**#CountPovertyOut #EndPoverty**



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# Four Industrial Revolutions

**1765**
1st revolution

**MECHANIZATION**

led by the steam engine

**1870**
2nd revolution

**MASS PRODUCTION**

driven by electricity and oil-based power

**1969**
3rd revolution

**AUTOMATED PRODUCTION**

supported by electronics and information technologies

**Today**
4th revolution

**NEW TECHNOLOGIES**

Internet of Things (IoT), Artificial Intelligence (AI); Big Data, Cloud, Cyber-Physical Systems...

Sources: https://www.visiativ-industry.ch/industrie-4-0/

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# Industry 4.0 refers to the convergence and application of nine digital industrial technologies


**Advanced Robotics**
- Autonomous, cooperating industrial robots
- Numerous integrated sensors and standardized interfaces

**Additive Manufacturing**
- 3D printing, particularly for spare parts and prototypes
- Decentralized 3D facilities to reduce transport distances and inventory

**Augmented Reality**
- Augmented reality for maintenance, logistics, and all kinds of SOP
- Display of supporting information, e.g., through glasses

**Simulation**
- Simulation of value networks
- Optimization based on real-time data from intelligent systems

**Horizontal/ Vertical Integration**
- Cross-company data integration based on data transfer standards
- Precondition for a fully automated value chain (from supplier to customer, from management to shop floor)

**Industrial Internet**
- Network of machines and products
- Multidirectional communication between networked objects

**Cloud**
- Management of huge data volumes in open systems
- Real-time communication for production systems

**Cybersecurity**
- Operation in networks and open systems
- High level of networking between intelligent machines, products, and systems

**Big Data and Analytics**
- Full evaluation of available data (e.g., from ERP, SCM, MES, CRM, and machine data)
- Real-time decision-making support and optimization

**Many application examples already exist for all nine technologies**

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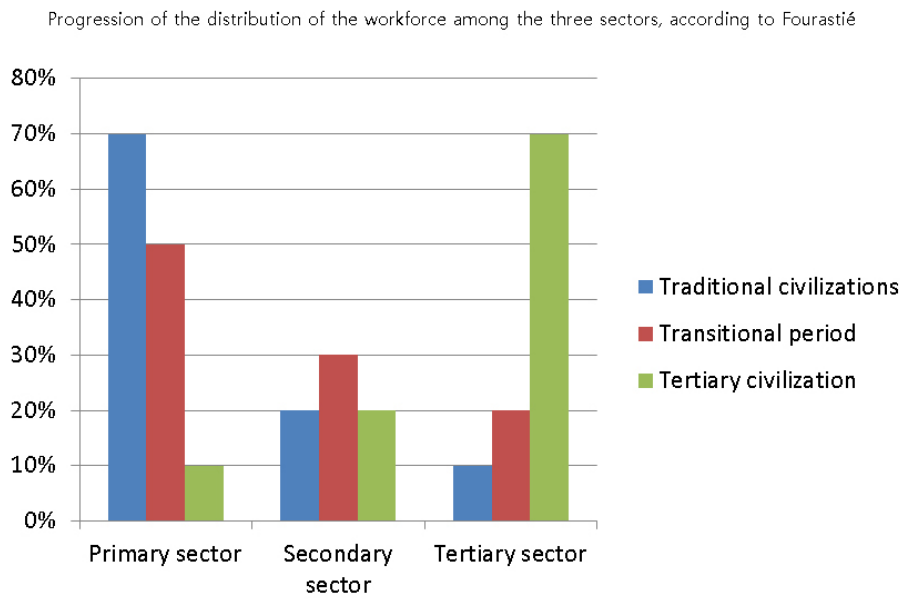
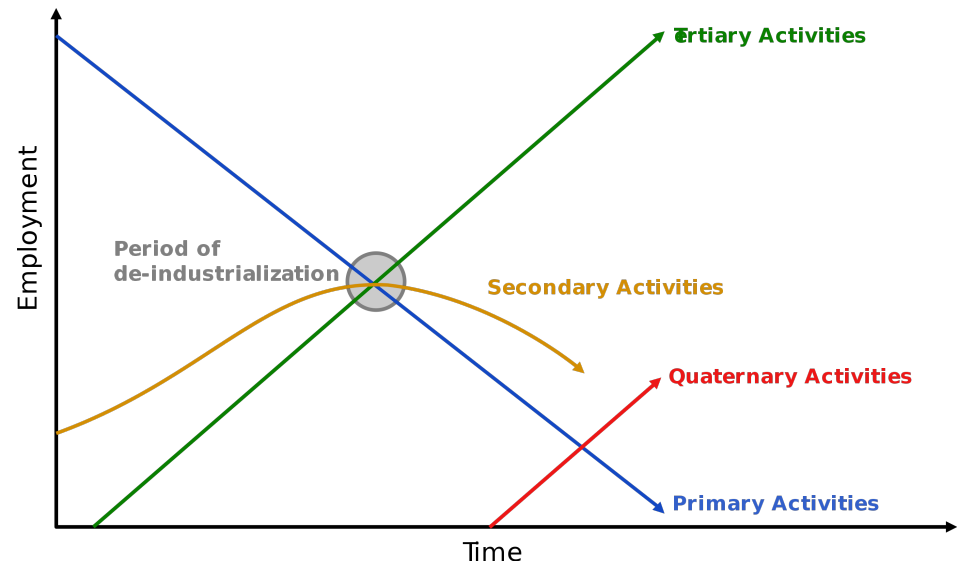
# The Three Sector Model




# Clark Sector Model



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# Industrialisation is not a 21st Century invention

## 1637 – Rene Descartes breaks down the difference in AI

- Pondered the possibility that ***machines would one day think and make decisions***.
- Proferred they would never be able to talk like humans.
- **Identified a division between:**
  - **Machines performing one specific task (specialised AI), and**
  - **Machines able to adapt to any job (general AI).**

## 1956 – John McCarthy: The birth of "artificial intelligence" (AI)

- Dartmouth College professor McCarthy **coins the term "artificial intelligence"**: natural language processing, computer vision, neural networks, machine learning, …

**1939 World's Fair**

- **General Motors** predicted the eventual arrival of driverless vehicles.

- **1961 - The Stanford Cart**
  Originally *built to explore how lunar vehicles* might function, then repurposed as an autonomous road vehicle.

- **2015 – General Motors: "Machines see better than humans."**

## 1991 – Tim Berners-Lee: The birth of the Internet

- CERN researcher Berners-Lee **put the world's first website online** and published the workings of the **hypertext transfer protocol (HTTP)**.
- **Computers connected to share data for decades,** mainly at educational institutions and large businesses.
- **Worldwide web** was the catalyst for society at large to plug itself into the online world: millions of people from every part of the world would be connected, generating and sharing data.
- **The fuel of AI**

**2010 – ImageNet**

- Algorithms compete to show proficiency in recognising and describing a library of 1,000 images – declare that machines are now outperforming humans.

- Since **2010**, the accuracy rate of the winning algorithm increased from 71.8% to 97.3% - promoting researchers to declare that *computers could identify objects in visual data more accurately than humans.*

**2018 - Google spin-off Waymo's self-driving taxi service**

- Launch of **Waymo's self-driving taxi** service in Phoenix, Arizona.
- First commercial **autonomous vehicle hire service**.
- **Waymo One** currently in use by 400 members of the public who pay to be driven to their schools and workplaces within a 100 square mile area.

- **Industry 4.0, I4.0 or I4** describes **automation and data exchange in manufacturing** technologies. It encompasses cyber-physical systems, the Internet of things, cloud computing and cognitive computing.

- *Industry 4.0 optimizes the computerization of Industry 3.0:* a combination of cyber-physical systems. The **Internet of Things (IoT)** and the **Internet of Systems (IoS)**

- Smart factory a reality.

# Impact of Industry 4.0

- Services and business models
- Reliability and continuous productivity
- Product lifecycles
- Industry value chain
- Workers' education and skills (Insufficient qualification of employees)
- Socio-economic factors
- Lack of regulation, standard and forms of certifications

# Some Challenges of Industry 4.0

a. Lack of understanding of I4.0 resulting in reluctance or low commitment from policy-makers and top management of companies or stakeholders
b. A gap of comprehension concerning the nature of industry 4.0 between well-developed countries and developing countries.
c. Unclear economic benefits/ Excessive investment
d. Lack of adequate skill-sets to expedite the march towards I4.0
e. Protection of industrial know-how
f. Threat of redundancy of the corporate IT departments
g. Loss of (many) jobs to automatic processes and IT-controlled processes, especially for lower educated parts of society
h. Unclear legal issues and data security

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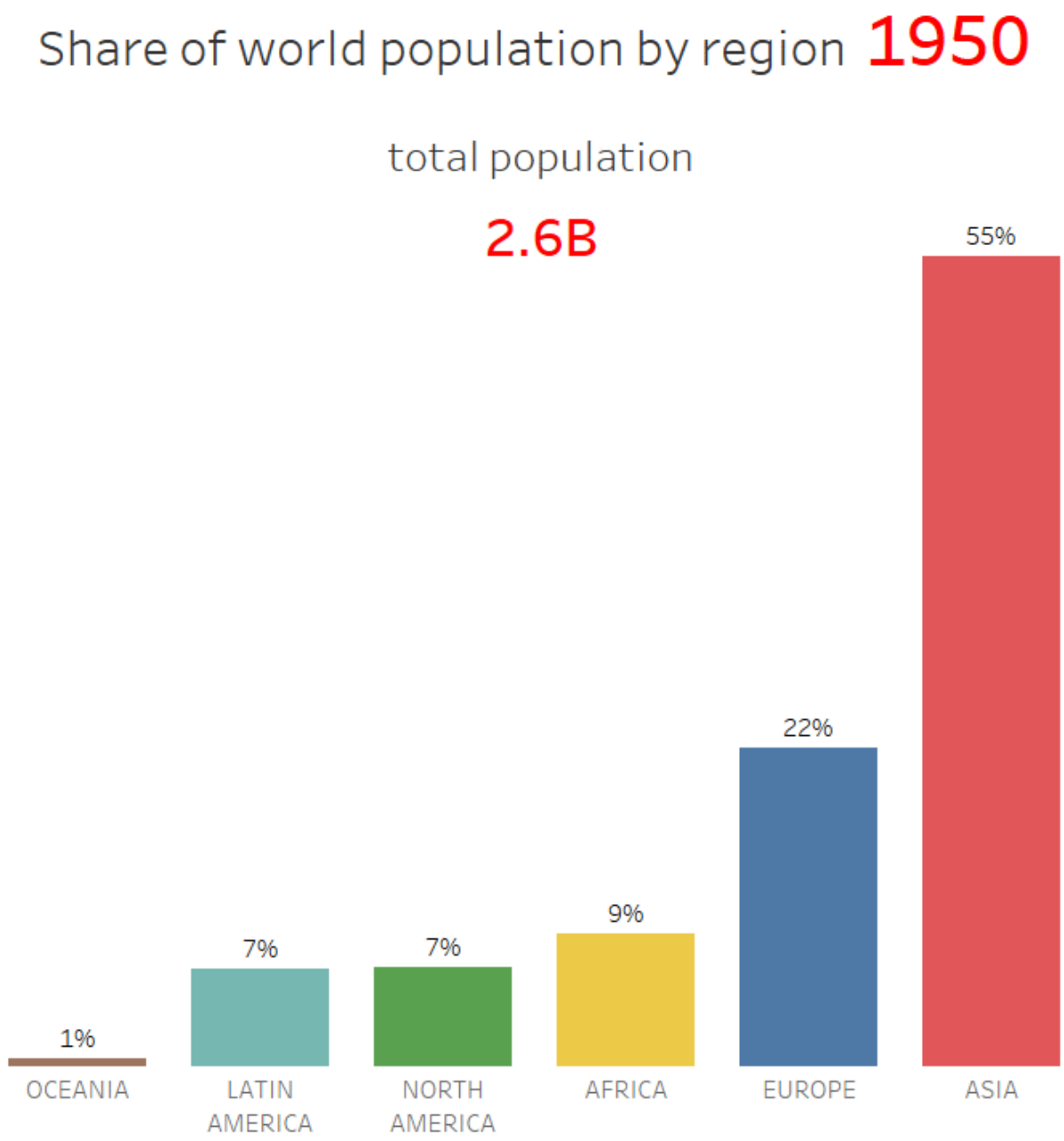
# Supporting I4.0 (at university)

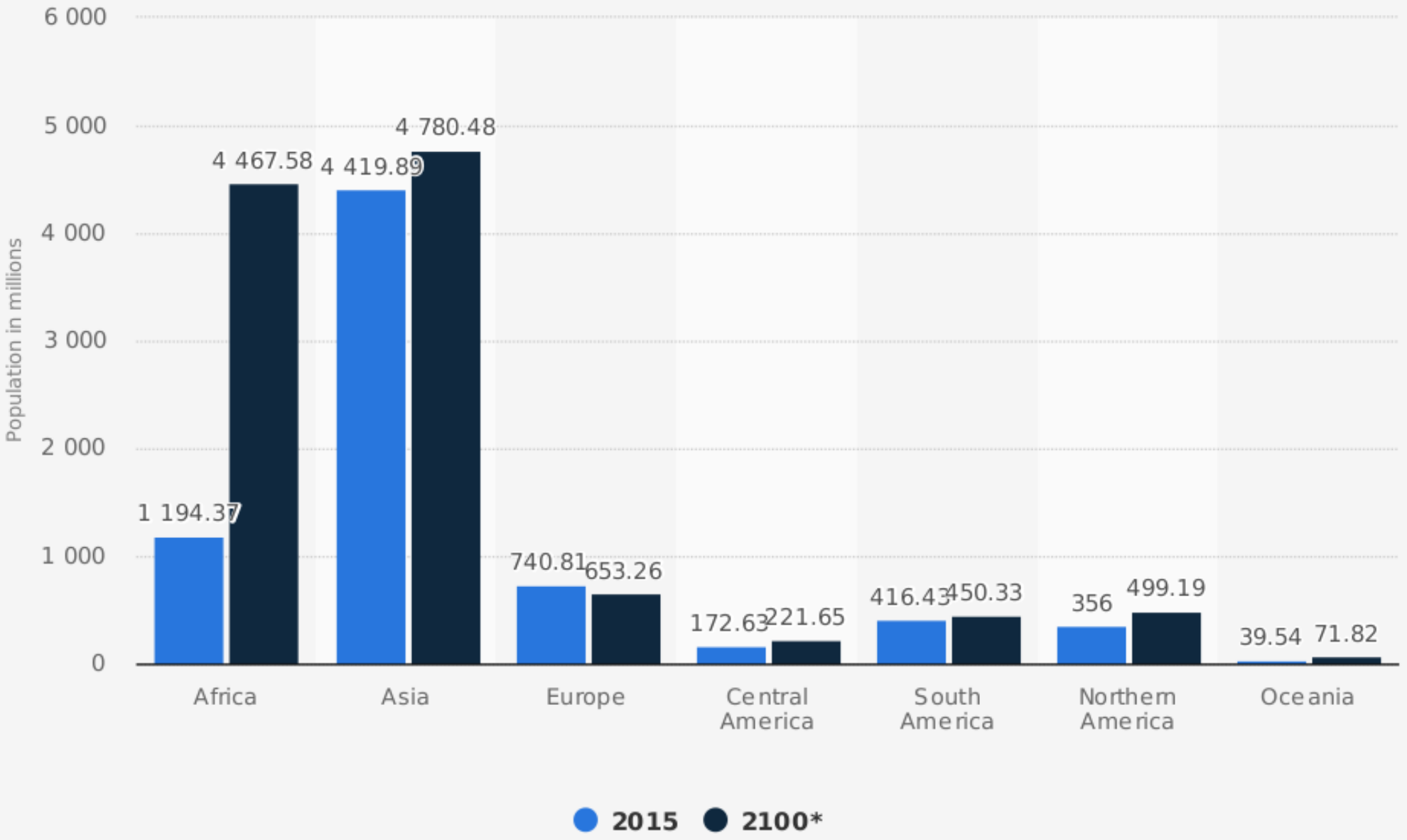
1. Encouraging students to master the IoT
2. Using digital technology to increase the productivity and competitiveness of micro, small and medium enterprises
3. Adopting augmented reality, the cloud system, the cybersecurity, autonomous robots and big data
4. Innovation of technology through start-up companies by facilitating the business incubation

- Bernard Marr, 2018

# Impact of Population on I4.0



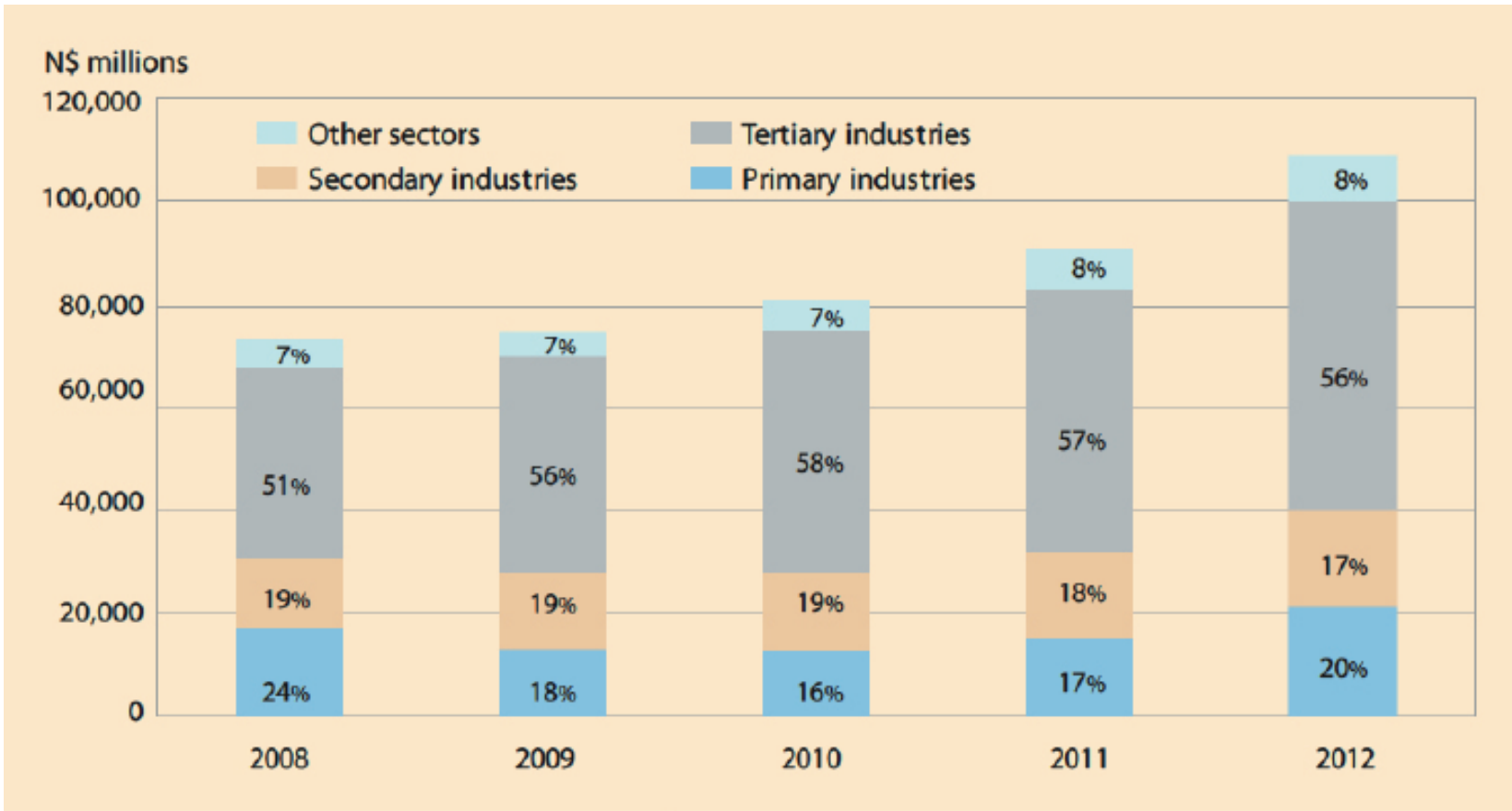
# Forecast of the world population for 2100, by continent




Source
United Nations


Additional Information:
Worldwide; United Nations; UN DESA; 2017

# Namibian Economy




Source: NSA, 2013

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# Diversify the Economy

MIT produced a free-of-charge tool to help countries work out how best to diversify, given their existing industries and skills:

**https://atlas.media.mit.edu/en**

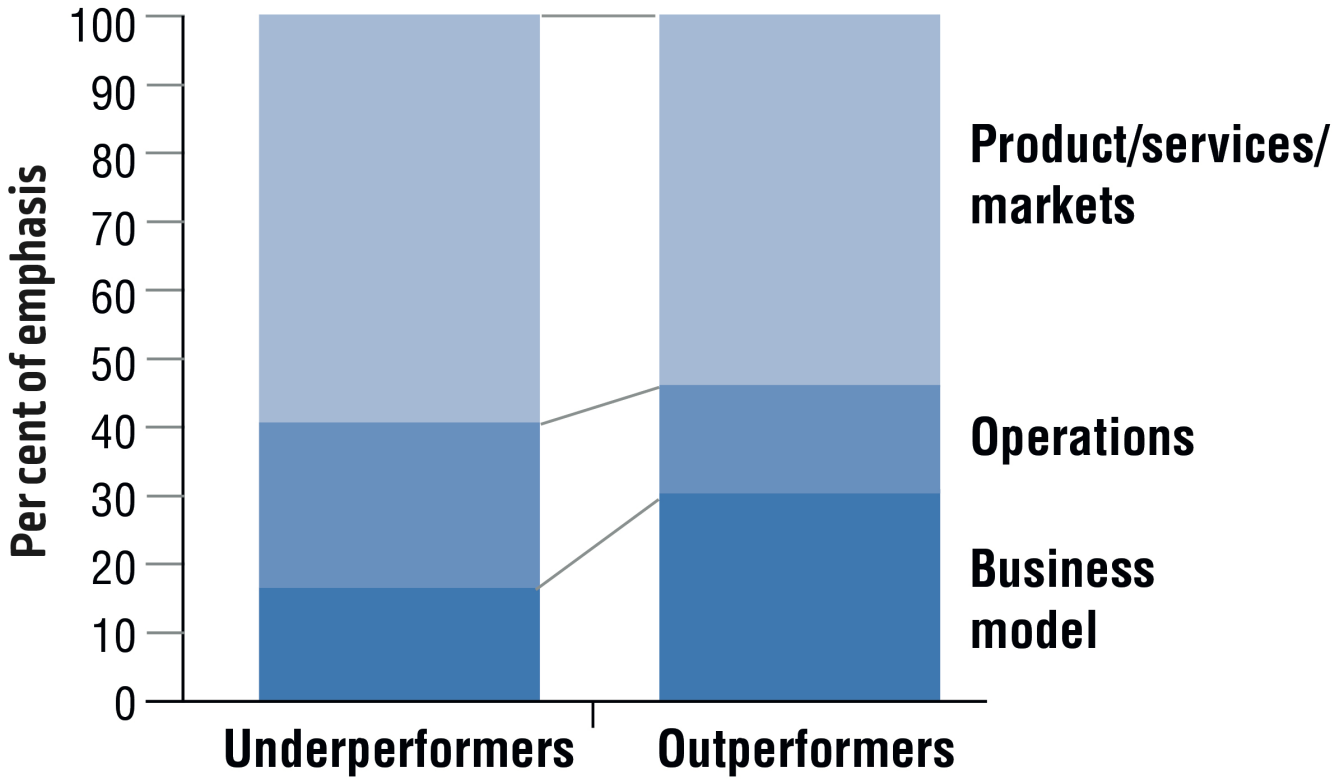
**The Observatory of Economic Complexity**

**Innovate**

## Paths to Success

*Three ways to innovate your business model*

**FIGURE 1: Profit outperformers focus on business model innovation more frequently than underperformers.**



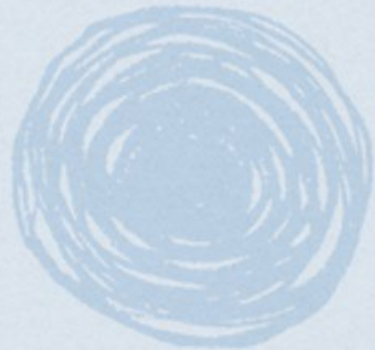

**Note:** Based on operating margin growth over five years as compared to competitive peers.

**Source:** *"Expanding the Innovation Horizon· The Global CEO Study 2006," IBM Global Business Services, March 2006.*

"We know a lot about what it takes to generate new ideas—
but so little about how to recognize the ones that are worth pursuing.
*The Innovation Blind Spot* is here to change that."
—**ADAM GRANT, #1 *New York Times* bestselling author, *Originals***

# THE INNOVATION BLIND SPOT

## WHY WE BACK THE WRONG IDEAS AND WHAT TO DO ABOUT IT



ROSS BAIRD

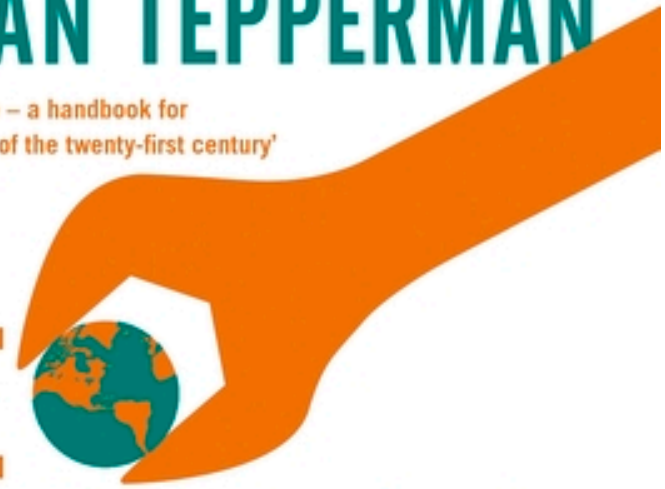
FOREWORD BY STEVE CASE, COFOUNDER OF AOL

JONATHAN TEPPERMAN

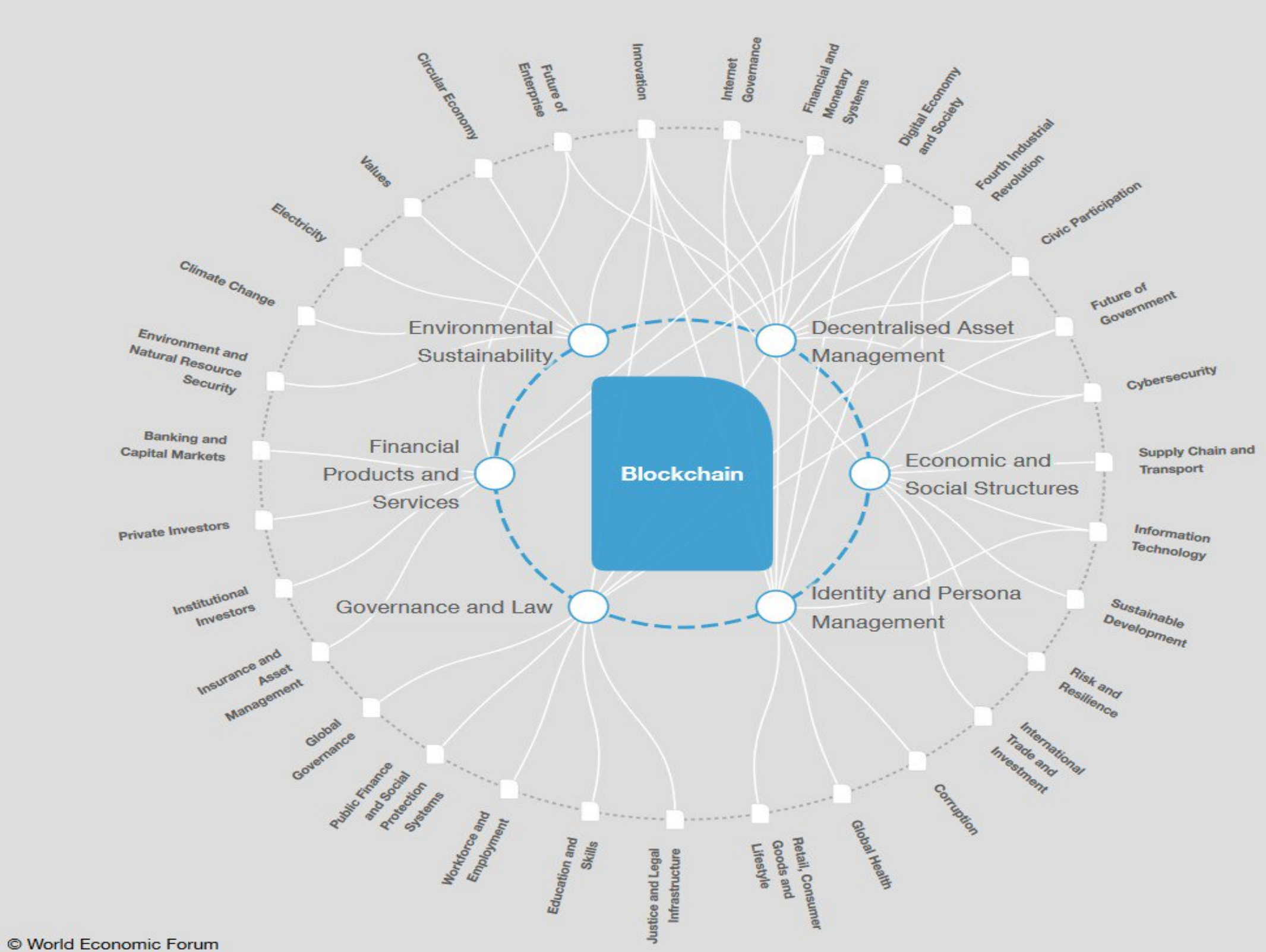
'Timely, lively and informative – a handbook for how to address the problems of the twenty-first century'
Peter Frankopan, author of *The Silk Roads*

# THE FIX

## How Nations Survive and Thrive in a World in Decline



BLOOMSBURY



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# Thank You.