IMPACT OF ICT ON SCIENCE AND INNOVATION

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Vienna, March 24th, 2015

Awti Adviesraad voor wetenschap, technologie en innovatie

THE AWTI

- Advisory council for science, technology and innovation
- 10 members from universities, research institutes and business
- Council and support staff
- Independent

Awti Adviesraad voor wetenschap, technologie en innovatie

OUR WORK: SOME EXAMPLES

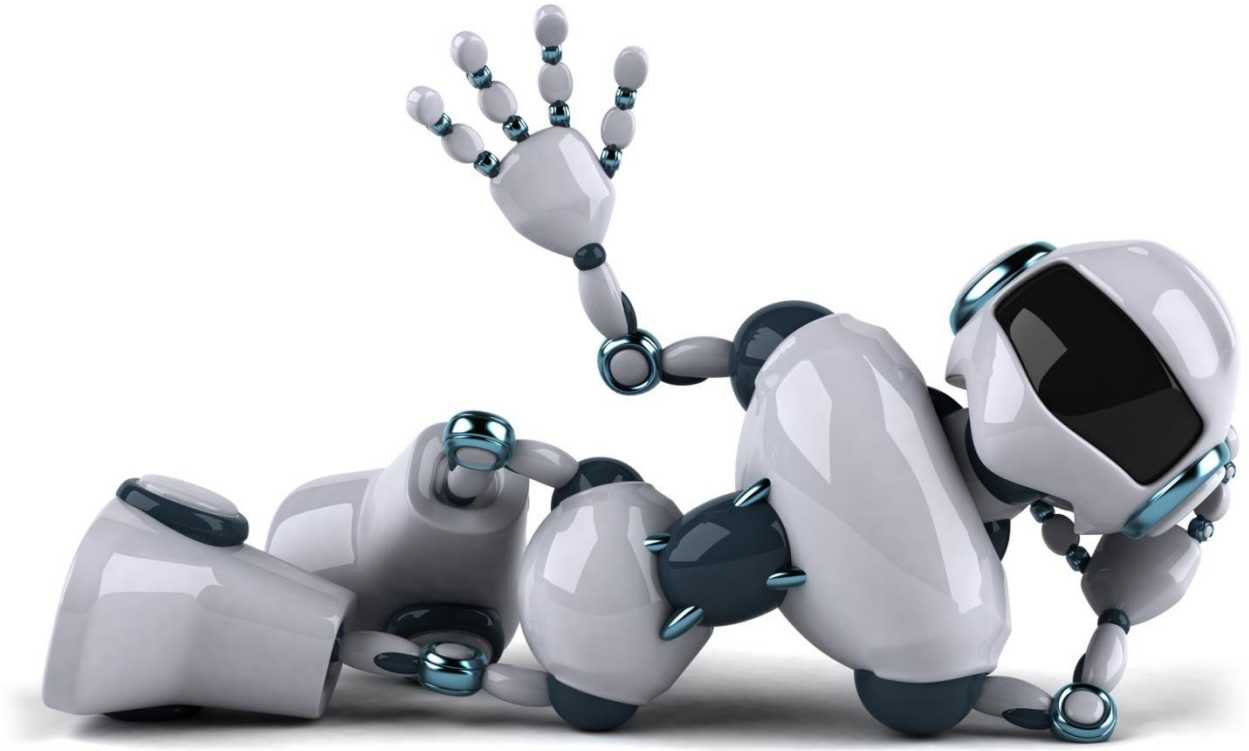
- Universities of applied sciences and SME's
- The importance of research for education
- Open science
- Technology and economics

WHAT IS IT THAT WE ACTUALLY DO?

- We develop and deliver policy advice …
- We make stories …

Technology and economics …

ARE WE READY FOR THE FUTURE?



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WHERE DO WE STAND?

- We do industrial policy: *"industry in the lead"* …
- We do science policy …
- Europe does key enabling technologies …
- Does this prepare us for the future?

ECONOMIC DYNAMICS

- Driven by technological change:
  - Mechanisation
  - New materials and sources of power
  - Automation and mass production
  - ICT
- Speed depends on social and economic processes and institutions:
  - Dynamics within and between industries
  - Markets for goods and services, finance and labour
  - Business models
  - Capacity development

ICT AS KEY ENABLER

- General purpose technology:
  - In all manufacturing and service industries
- Large potential for development:
  - Exponential growth: ‘Moore’s law’
  - Big data: volume, velocity, variety
  - Innovating = combining
- Fundamental driver of change:
  - Enabler of key enabling technologies

KEY TECHNOLOGIES (MGI)

1. Mobile Internet
2. Automation of knowledge
3. The Internet of Things
4. Cloud technology
5. Advanced robotics
6. Autonomous and near-autonomous vehicles
7. Next-generation genomics
8. Energy storage
9. 3D printing
10. Advanced materials
11. Advanced oil and gas exploration and recovery
12. Renewable energy

TWO CHANNELS

- ICT affects the economy in two ways:
  - Directly: structure and functioning of the economic system
  - Indirectly: research and innovation

THE ECONOMY

Earlier GPT's	Effect	ICT	Effect
Replaces physical labour		Replaces cognitive labour	
Reduction in production costs	Hierarchy	Reduction in transation costs	Networks and markets
Scale increase	Concentration of production	Scale decrease	Fragmentation of production
Production costs dominate development costs	Fragmentation of markets	Development costs dominate production costs	Concentration of market power
Stand alone technologies		Technological platforms	

THE ECONOMY

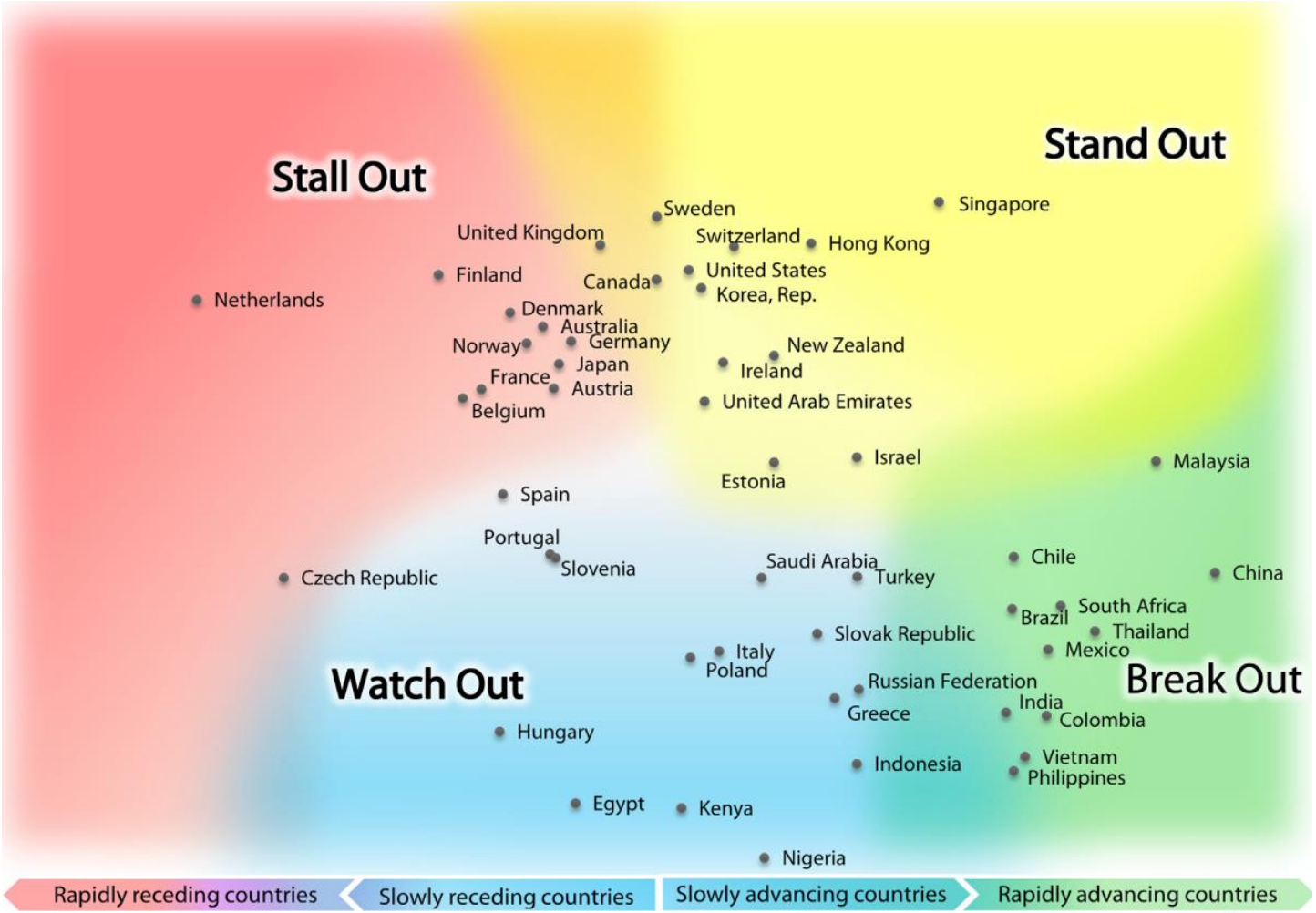
- Macroeconomic consequences:
  - New goods and services
  - Hollowing out of the middle class
  - Return to capital?
- ICT drives structural change:
  - Industries: manufacturing resembling services
    services resembling manufacturing
  - Markets: mass customization, niches, ‘winner takes all’
  - Businesses: small world players
- ICT requires new business models

RESEARCH AND INNOVATION

- ICT is a toolbox that changes how research is done:
  - From deductive to inductive (data mining, pattern recognition)
  - From analytic to synthetic and transdisciplinary
  - From reductionist to integral

- ICT changes the organisation of research and innovation:
  - From ‘in house’ to networked
  - From closed to open innovation
  - With users
  - With citizens

DOES POLICY UNDERESTIMATE ICT?



PUBLIC RESPONSIBILITIES

- ICT-infrastructures – privately provided public goods:
  - Internet (net neutrality, access, security, privacy)
  - Big data
- Income distribution
- Public ICT-investments

- Innovation policy
- Research policy
- Education policy

PROPOSITIONS

- Research and innovation:
  - Governments should pursue a coherent policy on ICT for research and innovation (infrastructure, capacity).
  - ICT urges for a new, transdisciplinary way of organizing and financing public research.
- Structural change:
  - Innovation policy should focus much more on ICT-driven services.
  - We all benefit from completion of the Digital Single Market.
  - Innovation policies should focus much more on small companies with the ambition to grow internationally.
- Capacity building:
  - Digital skills should be much more part of school curricula.
  - Life long learning should be facilitated.
  - Entrepreneurial skills should be fostered.