EXPONENTIAL TECHNOLOGICAL CHANGE
ARTIFICIAL INTELLIGENCE

Alpha Go
Driverless car, …
Smart manufacturing, IoT, Industry 4.0, ......
3D PRINTING
WIDE APPLICATIONS IN MANUFACTURING & BEYOND, PRIVATE & PUBLIC SERVICES

Source: Gartner, 2016; Weigel, 2016
IMPACT ON ECONOMIC DIVERSIFICATION
AND STRUCTURAL CHANGE
Impact: Two-sided story

• Connectivity enhancing & human empowering
  Eg. Mobile phone tech, internet, Cloud, 5G, big data
  Impact: connectivity, access, empowerment, efficiency, making impossible possible. - Universal

• Human replacing
  Eg., automation, robotics, AI

1. Efficiency gains, consumer welfare
2. Work condition improvement
3. Job creation vs replacing
4. Income inequality
STRUCTURAL CHANGE AND DIVERSIFICATION

- The rise of new industry and new economy
- The increase of jobs in some sectors
- The replacement of jobs and exit of some sectors
- In a wide spectrum of sectors, not only blue collar workers (from lorry drivers, office white collar, to highly skilled financial sector)
- Overall the newly created jobs is likely to be less than the replaced

- Some estimations:
  - 85-90% of future jobs will require ICT skills
  - 47% of US employment is at risk of automation
  - The share of jobs at risk of automation is even higher in developing countries:
    - 77% of all jobs in China
    - 69% in India
    - 85% in Ethiopia
  - However, the replacement of workers by robots will only occur when is economically profitable (UNCTAD, 2017)
DISTRIBUTIONAL EFFECT

• Why? Biased technical change
• Greater income inequality (significant)
• Capital vs labour; Skilled vs un-skilled
• Challenges to low income countries: further backwardness
• Deepening global income divide
STRUCTURAL CHANGE AND DIVERSIFICATION: OPPORTUNITIES FOR DEVELOPING WORLD

• Industry robotics? – Economic feasibility, more serve DCs

• New industry based on AI, Big Data & IoT? – Yes in theory, currently limited due to applications, capabilities and infrastructure

• Internet – Yes in theory, esp. e-commerce, e-services, culture and creative industry,

• 3D printing - Revolution in global production network. Distributed localised production replaces mass production
  - Depends on economic feasibility, industry characteristics. If substantial breakthrough, challenges to existing major manufacturing countries
BENEFITING FROM EMERGING TECHNOLOGIES

- BUILDING DIGITAL CAPABILITIES AND DIGITAL INFRASTRUCTURE

Otherwise, not able to capture the opportunities; opportunities for LDCs to catch up narrowed
GAPS IN ICT USE

- Individual using the Internet:
  - 41.3 out of 100 in developing countries;
  - 81 out of 100 in developed countries
- Gender gap in Internet use (estimated 2016):
  - Worldwide: 12%, 31% in LDCs
- Digitalisation offer important opportunities for women:
  - 73.9% e-business owners on Chinese e-shopping website Taobao are women
- Women are less represented in ICT workforce:
  - Women are 31% of Google’s overall workforce yet they comprise only 20% of technical positions (Google, 2017)
  - Women are 17% of Facebook workforce (Williams, 2016)
- Percentage of youth using the Internet:
  - 70% world average; 94% in developed countries; 67% in developing countries; and only 30% in LDCs
  - Out of the 830 million young people who are online, 320 million (39%) are in China and India.
  - Nearly 9 out of 10 young individuals not using the Internet live in Africa or Asia and the Pacific.
HOW TO BUILDING DIGITAL COMPETENCIES FOR ECONOMIC DIVERSIFICATION AND STRUCTURAL CHANGE?

- Digital Skills and competencies in the digital era
- New Technologies for Digital Competencies
- Policy considerations
Digital Skills and competencies in the digital era
Different levels of digital skills

- Adoption of technologies
- Basic use of technologies
- Creative use with adaptation of technologies
- Creation of new technologies
### Categories and levels of digital skills

<table>
<thead>
<tr>
<th>Category</th>
<th>Levels</th>
<th>Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Digital Skills for All</strong></td>
<td>Adoption</td>
<td>Basic education and literacy; Familiarity with technology devices and services;</td>
</tr>
<tr>
<td></td>
<td>Basic use</td>
<td>Basic understanding of technologies, software and applications; Knowledge of digital privacy and security</td>
</tr>
<tr>
<td><strong>Digital Skills for ICT professionals</strong></td>
<td>Creative use of adaptations</td>
<td>Basic computing skills; Familiarity with basic algorithms</td>
</tr>
<tr>
<td></td>
<td>Creation of new technologies</td>
<td>Sophisticated programming skills; Knowledge of complex algorithms</td>
</tr>
</tbody>
</table>

UNCTAD, 2017
# Types & examples of digital competencies

<table>
<thead>
<tr>
<th>Types</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical and professional skills</td>
<td>Installation and operation of robots;</td>
</tr>
<tr>
<td>Generic ICT skills</td>
<td>Understanding, use and adoption of technologies; Life-learning ability to adapt to technology changes</td>
</tr>
<tr>
<td>ICT complementary “soft skills”</td>
<td>Creativity; communication skills; critical and logical thinking; teamwork; digital entrepreneurship</td>
</tr>
</tbody>
</table>

Source: (OECD, 2016)
## New Technologies for Digital Competencies

<table>
<thead>
<tr>
<th>Trends</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology-mediated teaching and learning</td>
<td>Laptops, internet resources and adaptive assessment system for teachers;</td>
</tr>
<tr>
<td></td>
<td>ICT facilities in classrooms</td>
</tr>
<tr>
<td></td>
<td>ICT for remote learning and life-learning</td>
</tr>
<tr>
<td></td>
<td>Platform for teacher-student interactions</td>
</tr>
<tr>
<td></td>
<td>Assistive technologies for individuals with disabilities</td>
</tr>
<tr>
<td>Massive Open Online Courses (MOOCs)</td>
<td>MOOCs for higher education (Coursera, edX, and Khan Academy)</td>
</tr>
<tr>
<td></td>
<td>MOOCs for vocational training (Alison)</td>
</tr>
<tr>
<td>Open Access to Scientific Literature</td>
<td>Open access journals and databases (PLOS)</td>
</tr>
<tr>
<td></td>
<td>Traditional publishers open to developing countries (PNAS)</td>
</tr>
<tr>
<td></td>
<td>Self-archiving websites (arXiv)</td>
</tr>
<tr>
<td>Scale Education Using the Internet</td>
<td>Media centre and remote learning</td>
</tr>
</tbody>
</table>

UNCTAD, 2017
CALL FOR POLICY AND REGULATORY GUIDANCE AND SUPPORT AND COLLABORATIVE EFFORTS

Xiaolan Fu
Oxford University