The Impact of rapid technological change on sustainable development

with particular reference to the SDG9

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Dimensions shaping the future of manufacturing

Future of Manufacturing

Technological

Policy strategies

Developmental
Technological dimension
Increasing attention to new technologies, under different labels

- Digital technologies
- 3D printing
- Biotechnologies
- New Materials
- Nanotechnologies

- Physical (autonomous vehicles, 3D printers, robotics, new materials)
- Digital (IoT, blockchain, platforms)
- Biological (genetics)

- Smart automation
- Internet of things
- Advanced robotics
- 3D Printing

- Big data, IoT and IA
- 3D printing
- Biotechnology
- Adv. materials & nano.
  Renewable energy
- Satellites and drones
- Blockchain
Technology focus of IDR 2020

Main focus of the report: advanced digital and production technologies applied to manufacturing

Other sectors/areas of the economy

Industrial sector

Source: UNIDO elaboration based on OECD (2016 and 2017), Schwab (2016) and UNIDO (2017)
Technology ladder: four generations in digital technologies

How to climb this “pyramid”? ...
or there are windows of opportunity for leapfrogging?

4.0: smart factory

The smart factory represents the frontier in the domain of digital and production technologies

3.0: Integrated production
use of ICTs, digital technologies and automation with integration and connection in all activities and areas of the company (e.g. internet-based sales support and support system)

But it coexists with older generations of digital and production technologies

2.0: Lean production
flexible or semi-flexible automation using ICTs without integration or with only partial integration between the areas of the company (e.g. CAD-CAM, which integrates design and production)

Cumulative process of technological learning (passing through each generation)...

1.0: Rigid production
Rigid and isolated automation using digital technologies and ICTs in a timely manner and in a punctual way in specific function (accounting, in design or production) (e.g. CAD)

Source: UNIDO elaboration based on project “Brazil Industry 2027”, CNI and IEL (2017).
Policy dimension
• Policy strategies

- Learning and experimentation
- Multiple interactions / coordination
- Converging policy realms
- Distributed power
- Context specific
Approaches to promote advanced manufacturing

Source: UNIDO elaboration based on Santiago (2018) and EU digital transformation monitor.
Development dimension
Rapid technological change and gaps between and within countries

**Emerging economies**
- Changing framework conditions to catch up / leapfrog copying and adapting to changing technological and market dynamics
- Upgrading and modernization through new technology absorption and use
- Deepening digitalization

**Least developed countries**
- Avoid falling behind copying and adapting to changing technological and market dynamics
- Finding new pathways towards industrialization
- Fostering digitalization

**Highly industrialized economies:**
- Maintain industrial leadership
- Foster innovation in frontier technologies
- New market creation: production technologies / platform technologies

Country-level strategic responses depend on accumulated technological, productive and other required capabilities: “twin challenge” of adaptation and survival, versus industrial leadership
Research agenda to analyze the impacts of rapid technological change on ISID

• Drivers / barriers for the development, diffusion and use of advanced technologies across the global south;

• Determinants of readiness to adopt new, advanced technologies at the firm / sector level;

• Global production and innovation value chains: restructuring, governance and strategic inclusion (firms, sectors, countries) across distinct levels of development;

• Manufacturing-related services: an opportunity to catch-up?

• International policy coordination and new challenges on capability building;

• Implications on leaving no-one behind: gender, employment, skills, spatial/regional development.