



**TECHNOLOGY  
AND INNOVATION  
REPORT  
2021**

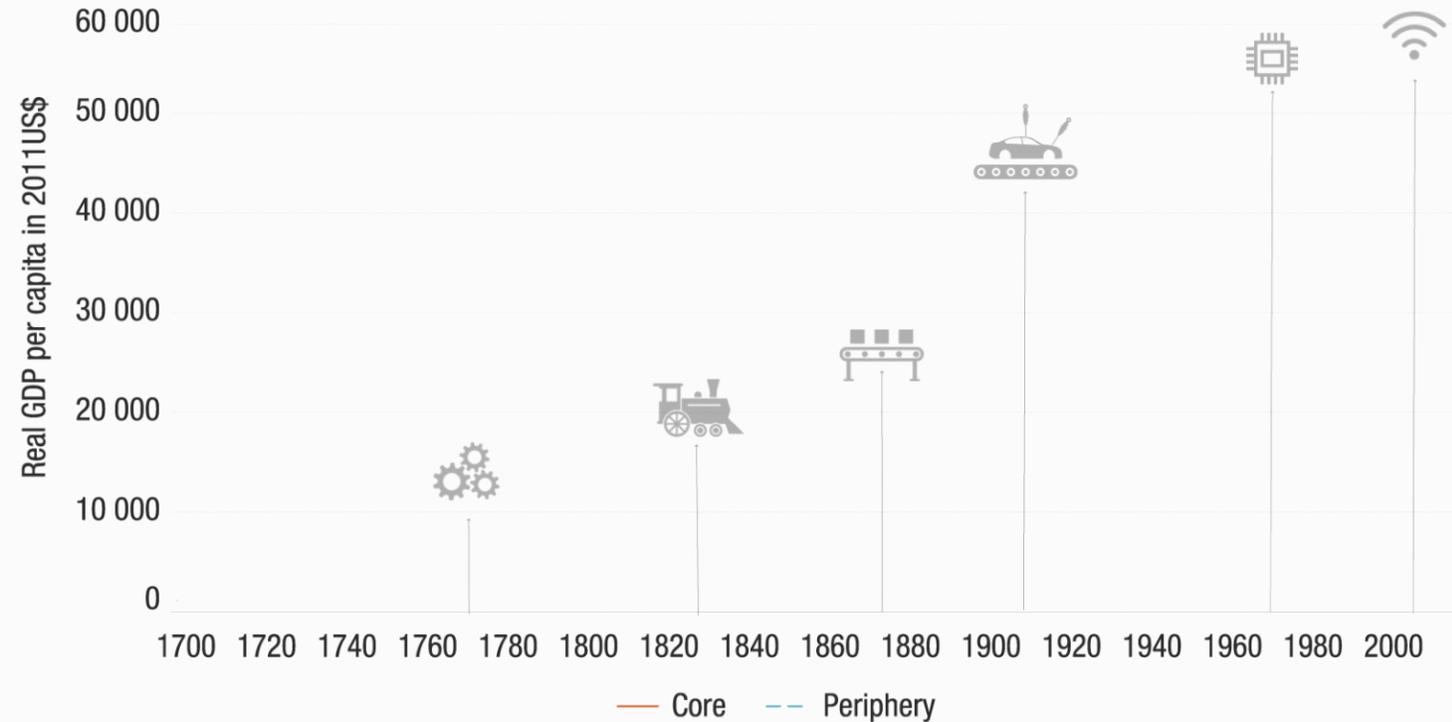


UNITED NATIONS  
UNCTAD

# CATCHING THE WAVES

The great divide, and waves of technological change.

## Technological change and inequality through the ages



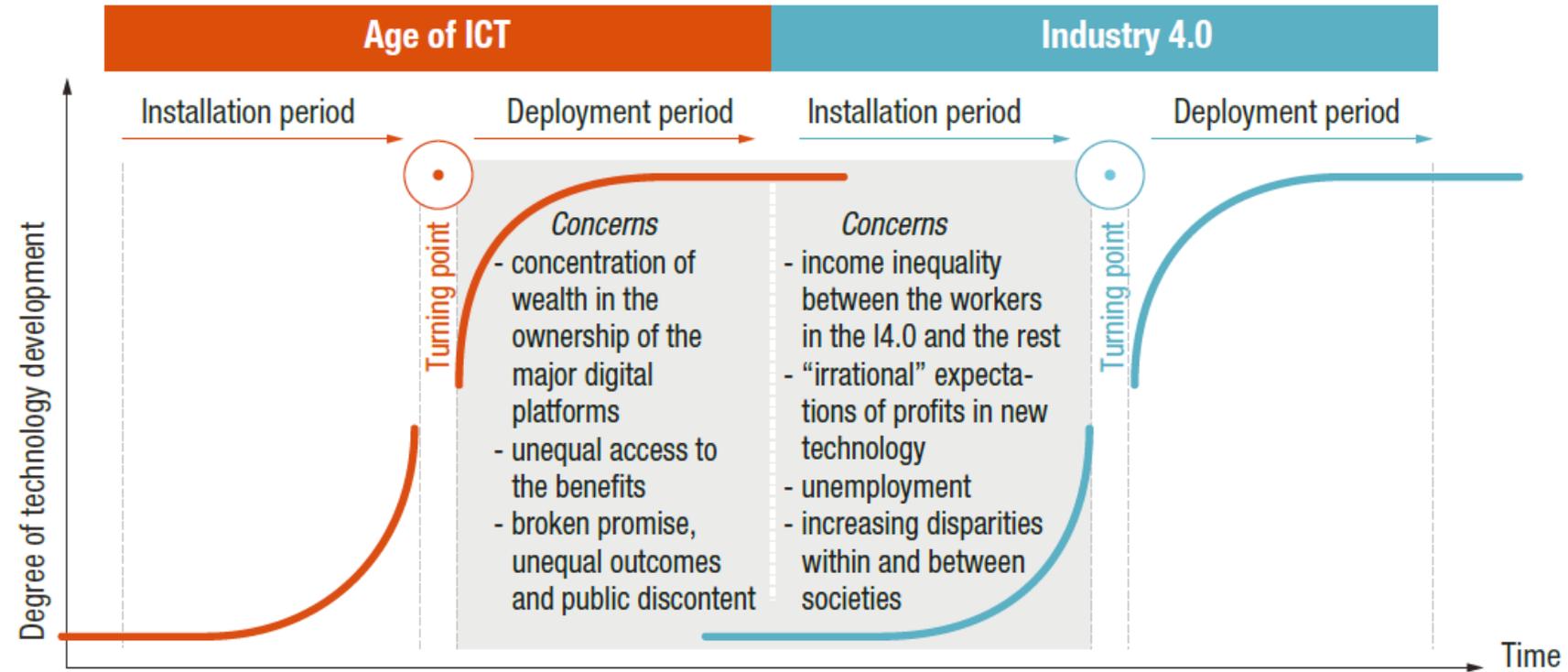
Source: UNCTAD's Technology and Innovation Report 2021

Source: UNCTAD, based on data from Maddison Project Database, version 2018, Bolt et al. (2018), Perez (2002), and Schwab (2013).

Notes: "Core" corresponds to Western Europe and its offshoots (i.e. Australia, Canada, New Zealand, the United States) as well as Japan. "Periphery" corresponds to the world, excluding the "core" countries.

# TWO-PHASE REVOLUTIONS

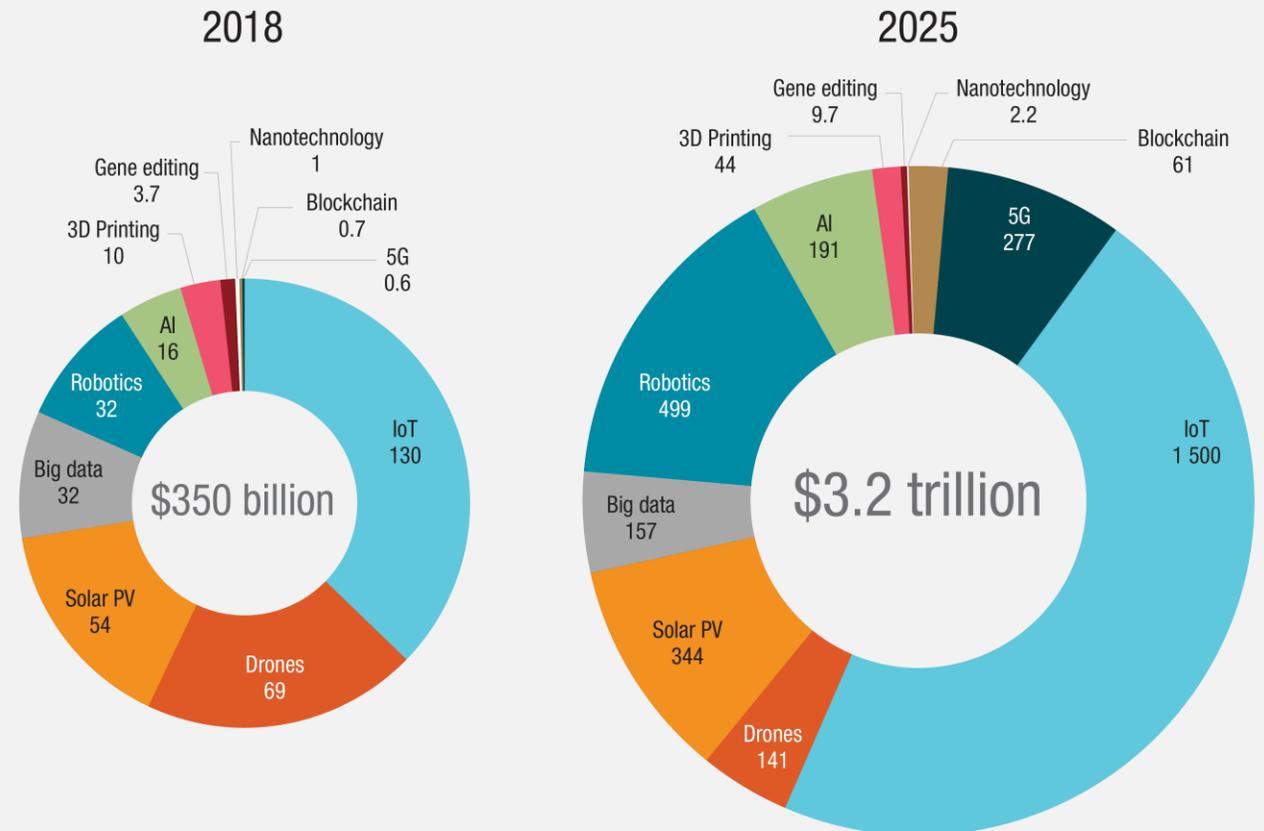
Technological revolutions and  
inequalities.



Source: UNCTAD based on Perez (2002).

## Market size estimates of Frontier technologies, \$billions

**FRONTIER TECHNOLOGY MARKETS ARE EXPECTED TO GROW RAPIDLY**



Source: UNCTAD based on data estimates from Froese (2018), MarketsandMarkets (2018), Sawant and Kakadee (2018), Business Wire (2019), Chaudhary et al. (2019), GlobeNewswire (2019b), MarketsandMarkets (2019), MarketWatch (2019a), MarketWatch (2019b), Raza (2019), Tewari and Baul (2019), Wagner (2019b), Mordor Intelligence (2020a).

# A COUNTRY READINESS INDEX

Readiness towards the use, adoption and adaptation of frontier technologies, selected countries

Country name	Total ranking	ICT ranking	Skills ranking	R&D ranking	Industry ranking	Finance ranking
<b>Top 10</b>						
United States of America	1	14	17	2	20	2
Switzerland	2	7	13	13	3	3
United Kingdom	3	17	12	6	11	14
Sweden	4	1	7	16	15	16
Singapore	5	4	9	18	4	18
Netherlands	6	6	10	15	8	23
Korea, Republic of	7	19	27	3	9	8
Ireland	8	24	6	21	1	87
Germany	9	23	16	5	10	39
Denmark	10	2	4	25	21	5
<b>Selected transition and developing economies</b>						
China	25	99	96	1	7	6
Russian Federation	27	39	28	11	66	45
Brazil	41	73	53	17	42	60
India	43	93	108	4	28	76
South Africa	54	69	84	39	71	13

Source: UNCTAD (see the complete table in Statistical Appendix. Readiness for frontier technologies index).

# COUNTRIES OVERPERFORMING

## RELATIVE TO PER CAPITA GDP

Gain in ranking position.

	Country	Overperformance (positions)		Country	Overperformance (positions)
1	India	65	11	Morocco	29
2	Philippines	57	12	Kenya	28
3	Ukraine	47	13	Nepal	28
4	Viet Nam	45	14	Serbia	25
5	China	40	15	Korea, Republic of	24
6	Jordan	34	16	Russian Federation	24
7	Brazil	33	17	Lebanon	24
8	Republic of Moldova	33	18	Togo	23
9	South Africa	29	19	United Kingdom	21
10	Tunisia	29	20	Ghana	20

*Source:* UNCTAD calculations based on GDP data by the World Bank (World Bank, 2020).

*Note:* Overperformance by gain in ranking position are measured taking the difference in positions between the actual index rankings and the estimated index rankings based on per capita income. For instance, India's actual index ranking was 43 while the estimated index ranking based on per capita income was 108. Hence, India overperformed by 65 ranking positions.

# AI AND GLOBAL ECONOMIC INEQUALITIES

## TYPE OF INPUT DATA



1

If AI primarily uses 'big data' generated by users, this will mainly benefit the United States and China, whose digital platforms gather massive amounts of such data.



2

If it primarily uses big data gathered by the Internet of Things this would benefit other countries with strong manufacturing – such as the EU, Japan and the Republic of Korea.

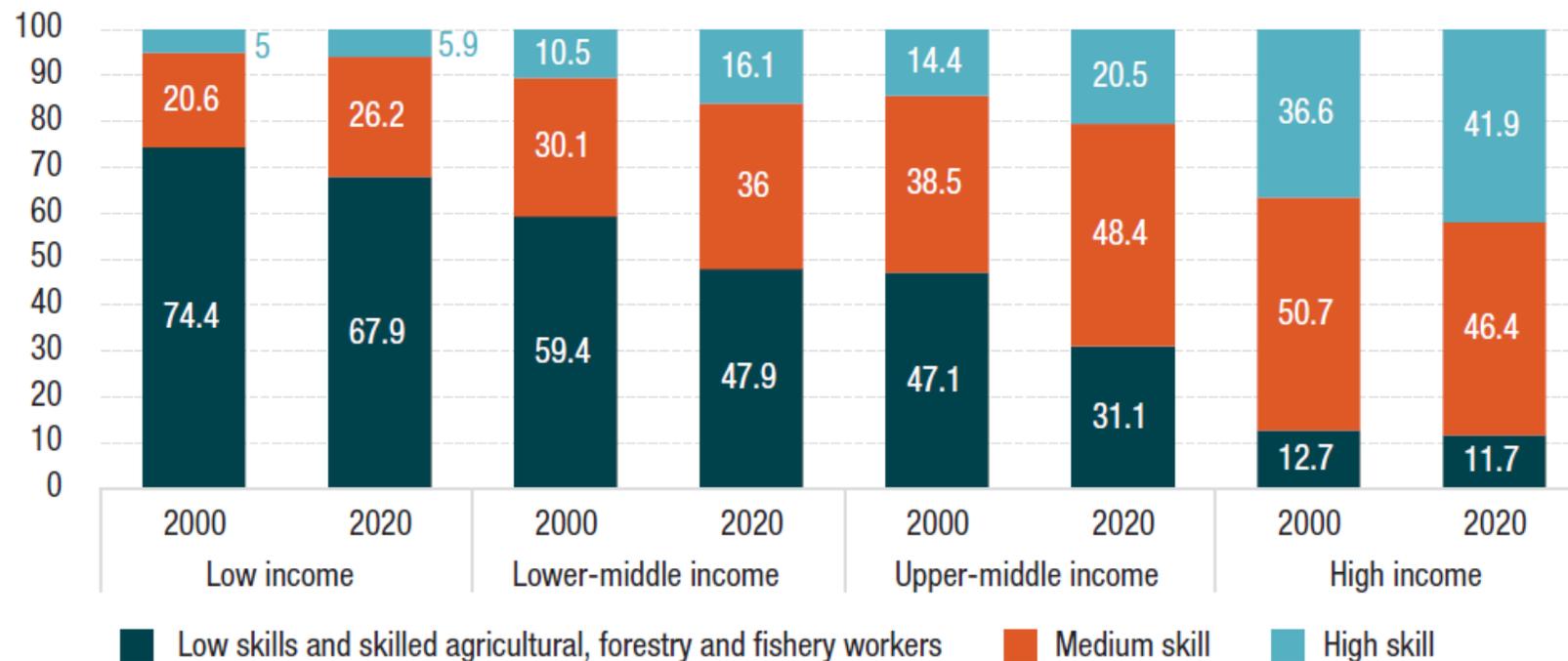


3

Allow computers to learn more like humans would still demand resources and capabilities more likely to be found in the developed countries.

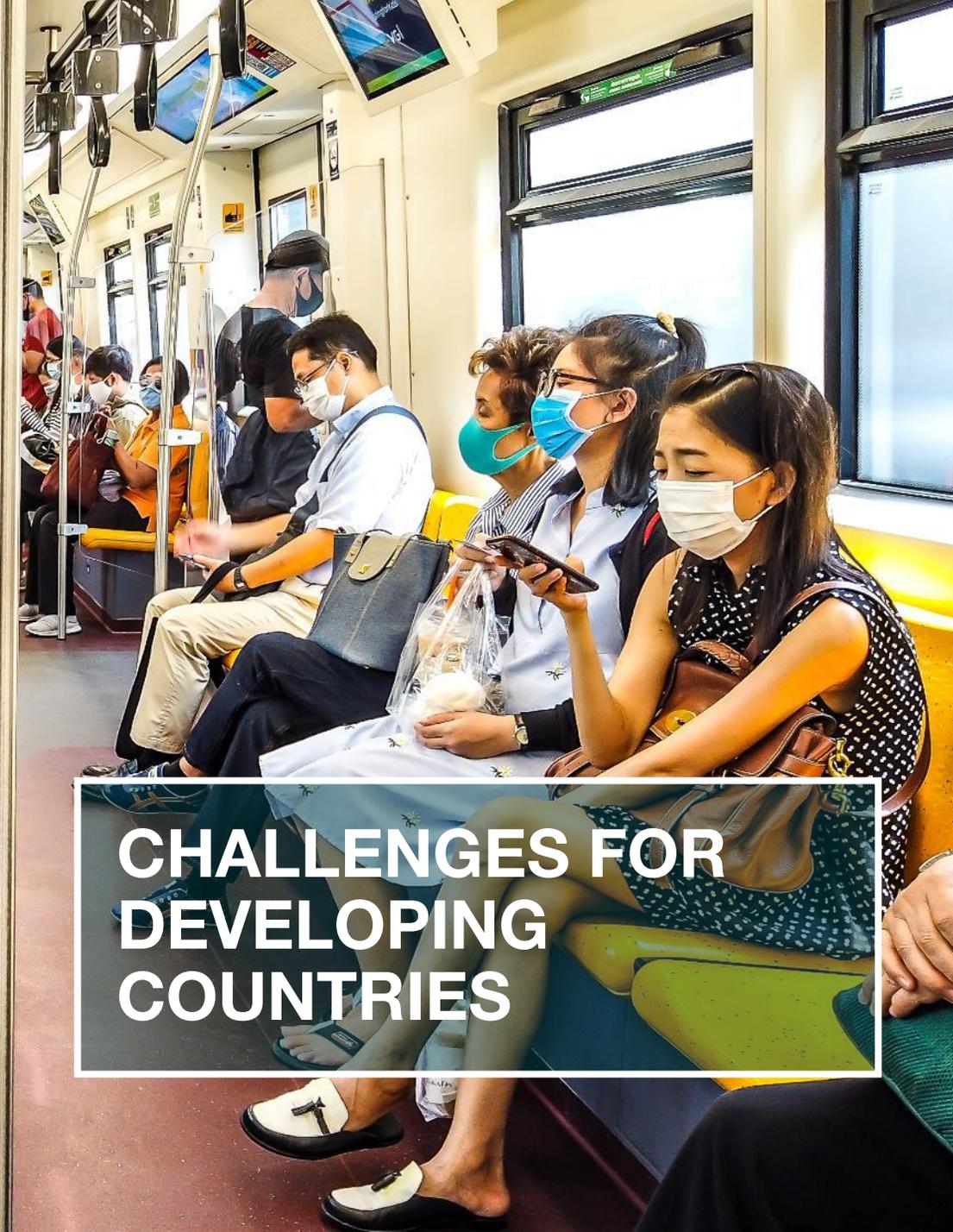
# JOB POLARIZATION

Employment by skill level  
(Percentage of total civil employment)



Source: UNCTAD based on data from ILOStat according to the ISCO-08.

Notes: Following ISCO-08 construction logic, a high skill level refers to major groups 1 to 3, a medium skill level to major groups 4, 5, 7 and 8, and a low skill level to major group 9 (skilled agricultural, forestry and fishery workers correspond to group 6, which is also considered medium skill but is combined with group 9 in the data made available by ILOStat).<sup>54</sup>



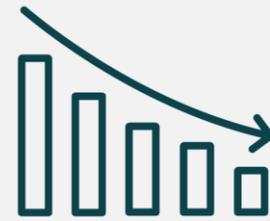
# CHALLENGES FOR DEVELOPING COUNTRIES



Demographic  
changes



Existing  
technological  
gaps



Low economic  
diversification



Weak financing  
mechanism



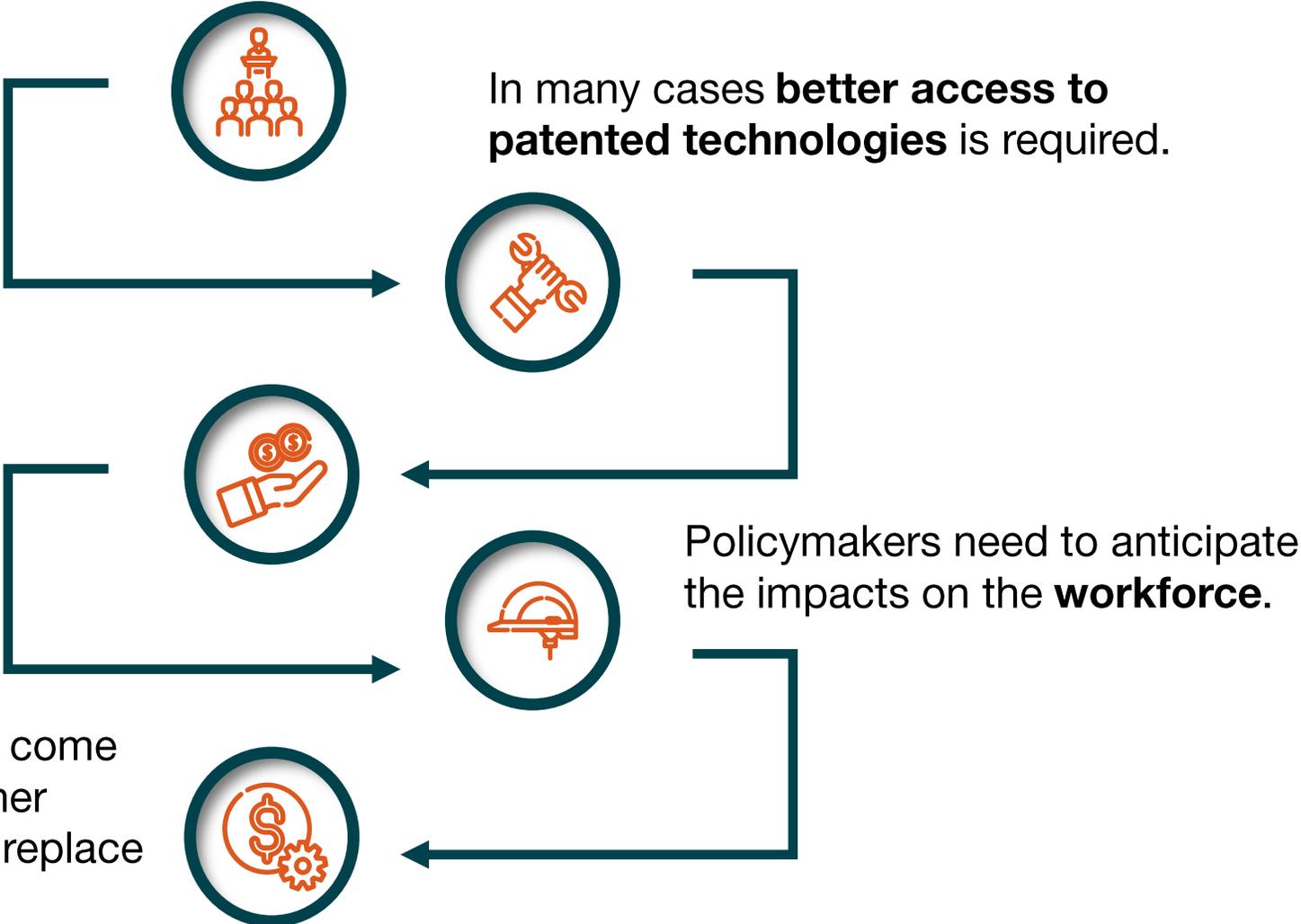
Stringent intellectual  
property rights

# ACCELERATING TOWARDS INDUSTRY 4.0

**National innovation policies** need to align with industrial policies.

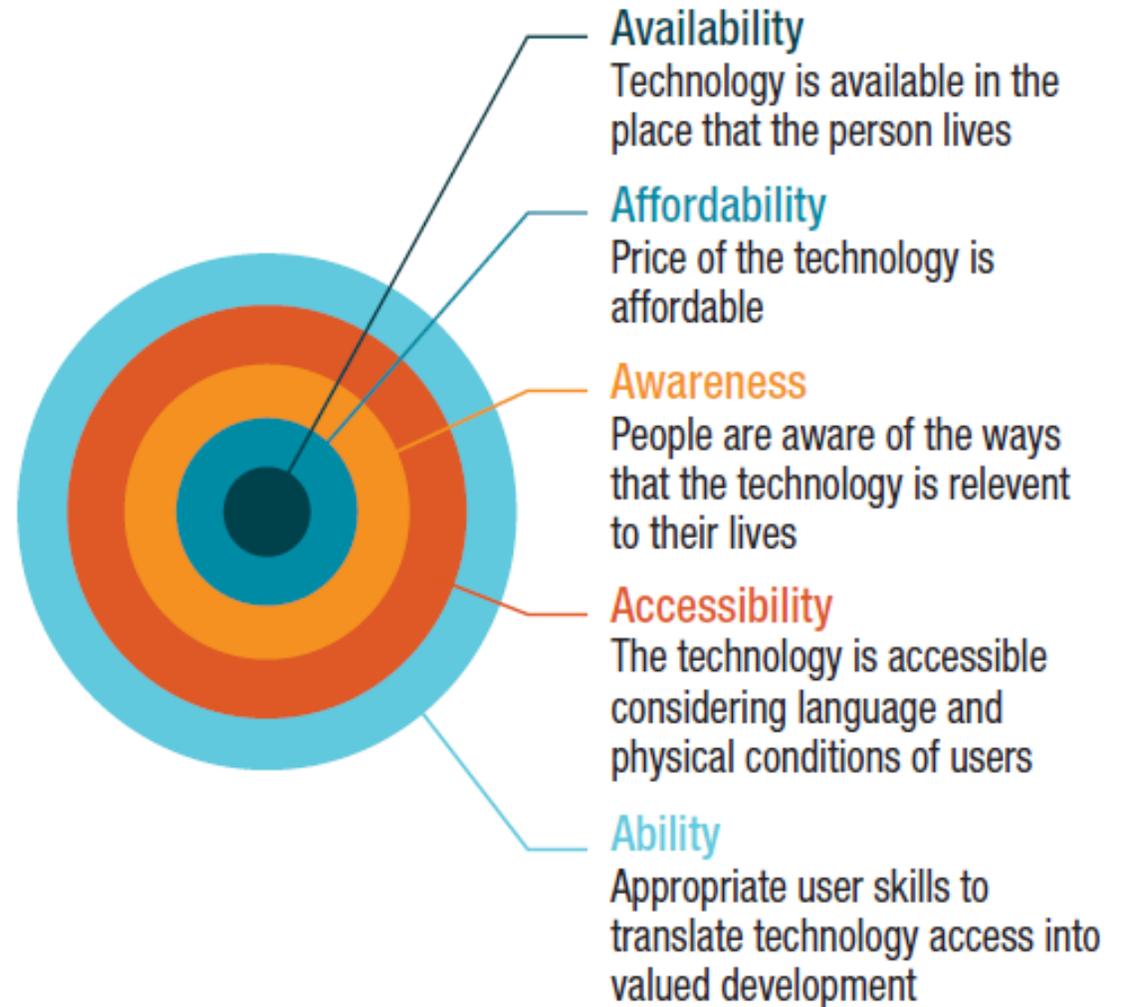
**Finance source** include official sources, impact investment, venture capital, crowdfunding, and Innovation and technology funds.

Finance for social protection could come from “**robot tax**” which would gather income from the technologies that replace workers



# TECHNOLOGIES AFFECTING INEQUALITIES THROUGH ACCESS & DESIGN

## Five as of technology access



Source: UNCTAD based on Roberts (2017) and Hernandez and Roberts (2018).

# CHALLENGES FOR DEVELOPING COUNTRIES



## Higher levels of poverty

Average share of the population living in extreme poverty:  
upper-middle-income 2%  
low-income countries 45%.



## Digital divide

Almost half of the world's population remains offline



## Shortage of Skills

in developing countries, the basic computer skills are on average 20 percentage points lower than in developed countries



# RISKS OF BIAS AND DISCRIMINATION



AI algorithms with built in bias



Genomic inequalities



Gene editing and intellectual property



Ethical questions in gene editing

# DIRECTED TO SUSTAINABLE DEVELOPMENT

International community needs to **guide new and emerging technologies**

Outcomes should be **fair, transparent, accountable, and inclusive**

It's important to **establish ethical frameworks, particularly for the deployment of AI**

For human germline gene editing there needs to be a broad **consensus on ethical and societal issues**



# THE ROLE OF CIVIL ACTIVISM



Continuously fight for reducing social-economic and digital inequalities

Break societal and institutional inertia

Keep governments, business, and financial sectors accountable

Raise awareness about unintended consequences

Drive behavioral changes to align technological development with societal goals

# CATCHING TECHNOLOGICAL WAVES



- Frontier technologies need to be steered
- This concerns all countries, but not all are equally prepared for it
- Governments, civil society participation, and international cooperation
- Developing countries cannot afford to miss this new wave of technological change.
- Appropriate STI policies to building a robust industrial base and promoting frontier technologies that can help deliver the 2030 Agenda



# Catching the waves



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