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Policy Brief

G20 COLLABORATION FOR SMOOTH TRANSITION TO 4IR IN DEVELOPING COUNTRIES

Task Force 1
Open Trade and Sustainable Investment

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Abstract

Industrial policies shape the ability of a country to export and shape its participation in global trade. The Fourth Industrial Revolution (4IR) has enabled a sudden shift in technology frontiers of countries backed by artificial intelligence (AI), robotics, 3D printing, block chain, big data, machine learning (ML), distributed ledger technology (DLT), etc; hence making production technologies in low-technology or "slow catching-up developing economies" redundant and lowering their exporting prospects. Moreover, a country's participation in trade in the future will be determined by the relative speed of adoption of advanced digital technologies in production, trade facilitation and logistics and distribution services. All countries are currently embracing 4IR at different paces; whether as part of a conscious strategy or learning by doing. Essentially, the future belongs to an era of managing 4IR than avoiding or delaying it.

While the economic dividends offered by such disruptions are potentially huge, cybersecurity risks, unemployment due to automation, skills gaps, lack of capacity and preparedness could be costly especially in developing nations. National policies/strategies on the 4IR should be at the centre stage guiding technological innovation, building resilient labour markets and up-skilling and re-skilling of people. Additionally, the 4IR has led to the creation of data in gargantuan proportions. Concentrating data in the hands of few private players could lead to data misuse and excludes other players from benefiting from it. To address this issue, an international framework for data protection, governance and regulations must be put in place. Greater reliance on e-commerce platforms for sale and purchase of goods and services brings concerns of data localisation and data privacy.

The Group of 20 (G20) has appreciated these evolving trends in the past presidencies. Most notably, the Japanese presidency advocated free flow of cross-border data which would enable higher trade and investment. However, major policy challenges have evolved across the G20 and non-G20 countries relating to data e.g. openness, transparency, consumer protection, standardisation, etc. This policy brief identifies the key enablers of this new industrial transition and issues relating to adoption of the 4IR with the possible role of the G20 in steering the 4IR frameworks in the future.

Challenges

The Fourth Industrial Revolution (4IR) is going to define the course of 21st century industrial policy. Advanced digital technologies such as artificial intelligence (AI), 3D printing, robotics, block chain, internet of things (IoT), distributed ledger technology (DLT), machine learning (ML), big data, cloud computing and others are enabling a transition towards the 4IR around the world. The 4IR essentially marks a radical departure from conventional manufacturing to digitalisation of manufacturing; characterised as end-to-end digitalisation. Major industrial economies like the United States, Japan, the European Union, South Korea, etc are already in the race to reap the "first mover advantage" of the 4IR through formulation of national industrial policies and revamping their institutional and innovation ecosystems. For instance, South Korea made a rapid transition to the 4IR through convergence of automation and data exchange in manufacturing technology. To enable firms to adapt to the digitalisation of manufacturing the government of Korea introduced the Manufacturing Industry Innovation-3.0 Strategy in 2014 as part of the Creative Economy Initiative. Manufacturing 3.0 leveraged the concept of smart factories, which involve fully technology-based manufacturing systems connecting the entire production process. The government of Korea has set a target of 30,000 smart factories by 2022 with support for small and medium enterprises (SMEs) and provision of training to 40,000 skilled workers. As rapid advances in information technology such as 5G, sensors and nanomaterials, etc take place, Korean manufacturing has undergone dramatic transformation in the recent years.

Well in advance, the EU launched the Digital Agenda for Europe in 2010 with the aim of reaping the economic and social benefits of a single digital market among EU members. Among the emerging markets, the so-called BRICS countries (Brazil, Russia, India, China and South Africa) are leading front-runners in 4IR adoption. All the BRICS countries have come up with strategies to fast-track the process of adoption of 4IR technologies. For instance, South Africa launched the National E-Strategy with the aim of establishing the country as a significant player in the development of information and communication technology (ICT) sectors, as well as accelerating the uptake of ICT in the production or delivery of products/services. Similarly, China came up with the "Make in China 2025" initiative with the objective of transforming China into a manufacturing hub by using the technological advances in manufacturing. Similarly, New National Strategy on Industry 4.0, Make in India initiative, and National Technology Initiative were launched in Brazil, India, and Russia respectively. Initiatives on 4IR by BRICS as a grouping assumed traction since the launch of

the BRICS Industry Ministers Meeting in 2015 during the Russian presidency and after adoption of the seven-point action plan during the Chinese presidency in 2017.

While individual BRICS economies are embarking on their own national industrial policies, BRICS countries in general are not prominently featuring as frontrunners of innovation in digital production technologies except China (UNIDO, 2020). Although UNIDO's characterisation of "BRICS-Less China" as the follower group on the global technology landscape, the BRICS countries are preparing for fuller adoption of 4IR in their industrial sectors. Moreover, BRICS continued to remain attractive destinations for foreign direct investment. In fact, BRICS countries are gradually converging with the developed countries in adoption of the 4IR in terms of three factors: (i) public initiatives in BRICS countries attracting talent from developed countries to BRICS, (ii) the role of multinationals and (iii) implications of educational institutions. Likewise, all Association of Southeast Asian Nations (ASEAN) countries have introduced a number of initiatives on the 4IR in the form of national digital economy master plans, innovation and entrepreneurship policies. The ASEAN Consolidated Strategy on the 4IR has identified six enablers to support the initiatives across three focus areas including (i) digital infrastructure, (ii) capacity building, (iii) institutions and governance, (iv) cooperation and collaboration, (v) resource mobilisation, and (vi) effective monitoring. ASEAN 4IR Strategy involves 73 ongoing initiatives and several future initiatives. The ongoing initiatives are in different segments such as technological governance and cybersecurity (13 nos), digital economy (29 nos), digital transformation of society (27 nos), and cross dimension initiatives (4 nos).

Technological transition in developing countries, although robust, is slow due to a multitude of socio-economic, cultural and political reasons. Lack of proper infrastructure, particularly digital infrastructure, in developing countries as well as their failure to successfully upgrade to previous technological revolutions has reduced their ability to cope with the 4IR. In addition, faster adoption of frontier technologies by developed countries is widening the technological gap, making it difficult for less industrialised countries to catch up. The failure to catch up faster with 4IR could be costly for the developing economies and no country can afford to follow the conventional catch-up path as the innovations in digital technologies happen at a much faster pace.

With greater awareness of cross-cutting applications of digital technologies, developing economies are embracing the 4IR with a pinch of salt, if not as a conscious policy choice. Undoubtedly, digitalisation is a transformative force for economic growth and societal progress. However, the fear of job loss, particularly in populous countries like India, South

Africa, etc remains a concern. It is estimated that the 4IR could lead to the displacement of 75 million jobs worldwide in the next four years (Betti and Palamaiu, 2021). Countries in Southern and North Africa with a manufacturing employment share of more than 10 per cent may be vulnerable to a fall in employment share depending on what they produce and whether it is for the home market or for exports (Fox and Signe, 2021).

Additionally, 4IR has raised concerns over the transfer, storage, pricing and usage of such data in view of the threat of monopolisation by private entities. Most importantly, data privacy concerns arising from overlapping harms e.g. appropriation of a person's picture or name for commercial advantage, surveillance of individual affairs and public disclosure of private facts; data flows in value chains, etc are crucial policy challenges. It is difficult to measure the value and consequences of different uses of data throughout the value chain. Heterogeneous approaches to data with respect to jurisdictions, countries and cultures often bring complexity in addressing the identified harms without any coordinated global policy approach.

Digital experience during COVID-19, building blocks for 4IR adoption

COVID-19 transformed the world to the businesses, households and governments. Supply chains have been digitalised with numerous micro, small and medium enterprises (MSMEs) getting connected to e-commerce platforms. Had it not been possible, a colossal loss of income, jobs and welfare could not have been avoided. Consumer reliance on digital platforms, despite being born out of necessity over the last two years, is now motivated by choice, indicating the steady accumulation of consumer trust in digital platforms. Companies have changed their operations, marketing and distribution channels marking radical shifts in their business models. As per a survey conducted by Mckinsey, businesses were able to cut their processing time dramatically during the pandemic, which is not simply a cost-saving exercise but a harbinger of change, (Table 1).

Table 1: Digitalisation reduces transaction costs

(No. of days)

Activity	Expected	Actual	Acceleration Factor (Multiple)
Increase in remote working and/or collaboration	454	10.5	43
Increased customer demand for online purchasing/services	585	21.9	27
Increased use of advanced technologies in operations	672	26.5	25
Increased use of advanced technologies in business decision making	635	25.4	25
Changed customer needs/expectations	511	21.3	24
Increased migration of assets to cloud	547	23.2	24

Activity	Expected	Actual	Acceleration Factor (Multiple)
Change in ownership of last-mile delivery	573	24.4	23
Increase in near-shoring and/or in-sourcing practices	547	26.6	21
Increased spending on data security	449	23.6	19
Building redundancies into supply chain	537	29.6	18

***Source*:** Mckinsey (2020)

Proposals for G20

Key enablers of 4IR transition

The Group of 20 (G20) and the world economy are going to embrace the 4IR in an accelerated fashion in the coming years. The growing spread of digital products and services will make this process irreversible regardless of the development status of the countries. ASEAN in its comprehensive 4IR Strategy has identified six enablers of 4IR for the member countries which are applicable to the larger family of emerging markets and developing economies. Those are: (i) digital infrastructure, (ii) capability development, (iii) cooperation and collaboration, (iv) institutions and governance, (v) resource mobilisation, and (vi) effective monitoring. These enablers correspond to an integrated and mutually reinforcing ecosystem approach which addresses multiple facets of the 4IR transition in developing countries such as digital readiness, enabling digital infrastructure and skilled human resources.

Our assessment of digital readiness in various countries by their income status reveals interesting developments. For mobile and internet indicators, the numbers look impressive for most of the country categories covered in Table 2. According to the International Telecommunication Union (ITU), mobile broadband subscription and the coverage of 3G and LTE mobile networks has increased rapidly across all the groups. Additionally, the international bandwidth has increased incredibly for developed and developing countries.

Table 2: Mobile and internet penetration growing rapidly across countries (per 100 inhabitants)

Indicators	World		Developed		Developing		LDCs		LLDCs		SIDS	
	2015	2020	2015	2020	2015	2020	2015	2020	2015	2020	2015	2020
Fixed-telephone subscriptions	14.0	11.6	39.0	33.4	8.9	7.4	0.9	0.8	3.8	3.3	12.1	11.6
Fixed-broadband subscriptions	11.4	15.8	29.5	34.6	7.6	12.1	0.8	1.4	1.9	2.9	6.7	8.0
Mobile-cellular telephone subscriptions	97.3	107.0	124.5	133.0	91.6	101.9	67.5	74.7	70.4	76.7	80.4	84.8
Active mobile-broadband subscriptions	44.6	77.3	89.2	127.1	35.4	67.5	14.9	36.3	19.7	40.0	31.8	54.4
Population covered by at least a 3G mobile network	78.3	93.6	94.0	97.8	75.0	92.8	53.3	79.0	49.8	78.6	61.5	87.8
Population covered by at least an LTE/WiMAX mobile network	43.4	85.0	85.4	98.0	34.7	82.4	15.4	44.1	12.3	41.9	34.9	65.4
International bandwidth (Tbit/s)	154.5	719.1	79.2	263.4	73.8	405.1	0.7	7.6	2.1	9.4	4.5	32.3
Households with Internet access at home (%)	47.9	65.7	80.1	87.8	36.5	57.8	10.7	22.0	20.8	31	..	48.4
Individuals using the Internet (%)	40.5	59.1	76.7	88.3	32.9	53.3	10.8	24.6	19.2	32.3	39.4	60.6

Source: ITU Statistics

Table 3 captures the trends in digital readiness in G20 countries. By and large, all countries are catching up faster in digital infrastructure and usage of digital services. It forms the backbone of the adoption of the 4IR.

Table 3: Faster catch-up in digital infrastructure and services (per 100 inhabitants)

Country	Internet users (%)		Fixed broadband subscriptions		Active mobile-broadband subscriptions		Mobile -cellular subscriptions		International bandwidth per Internet user (bit/s)		Fixed -telephone subscriptions	
	2015	2020	2015	2020	2015	2020	2015	2020	2015	2020	2015	2020
Argentina	68.0	85.5	15.9	21.2	76.7	68.6	143.6	121.2	35157.7	..	23.4	16.3
Australia	84.6	89.6	28.5	35.7	126.4	124.2	107.7	107.7	27671.5	..	35.5	24.3
Brazil	58.3	81.3	12.5	17.1	88.3	89.7	126.1	96.8	23477.3	..	21.4	14.4
Canada	90.0	97.0	36.4	41.9	61.2	72.2	82.6	85.7	61682.7	..	43.3	35.3
China	50.3	70.4	19.7	33.6	55.3	94.8	91.8	119.4	6506.0	43459.9	16.4	12.6
France	78.0	84.8	41.7	46.9	75.3	99.3	103.5	111.5	47735.2	..	60.4	57.8
Germany	87.6	89.8	37.5	43.2	71.5	90.7	117.8	128.2	42575.5	..	55.4	45.7
India	14.9	43.0	1.3	1.7	9.2	52.5	76.4	83.6	9777.7	56109.8	1.9	1.5
Indonesia	22.1	53.7	1.5	4.3	41.6	104.2	131.2	130.0	26603.7	119998.4	4.0	3.5
Italy	58.1	70.5	24.6	30.0	82.9	93.2	144.8	128.3	28391.8	..	33.4	32.4
Japan	91.1	90.2	30.4	34.8	127.2	202.3	125.5	154.2	21610.1	..	49.8	49.0
South Korea	89.9	96.5	39.4	43.5	107.4	116.9	116.0	137.5	45777.3	..	56.8	46.5
Mexico	57.4	72.0	12.1	17.0	52.5	78.6	88.4	95.3	30599.8	..	16.6	19.0
Russia	70.1	85.0	18.5	23.2	69.8	100.2	156.8	163.6	27553.4	..	24.5	17.7
Saudi Arabia	69.6	97.9	20.0	22.7	105.3	118.9	166.5	124.1	83581.4	351794.1	11.8	16.5
South Africa	51.9	70.0	2.5	2.2	57.4	110.7	158.9	161.8	15301.1	27363.3	7.5	3.5
Turkey	53.7	77.7	12.1	19.8	49.7	77.8	93.8	97.4	57652.0	135690.2	14.6	14.8
United Kingdom	92.0	94.8	37.4	40.3	84.8	107.7	120.3	116.4	363087.0	..	50.4	47.2
United States	74.6	90.9	31.9	36.6	117.0	156.7	119.1	106.2	100322.6	..	38.9	30.7

Source: ITU Statistics

Taking into account the systemic changes happening across the world, we propose the following actions that the G20 might consider implementing to achieve smooth and faster adoption of the 4IR.

1. Leap-frog, rather than just follow

Developing countries need to make significant progress in upgrading their economies to the current technological innovations, as well as embracing the 4IR. Given the rapid and disruptive nature of digital technology, no country particularly developing countries, can

afford to follow the traditional catch-up model that has explained previous industrial revolutions. The way to remain relevant today is to "leap-frog", not in the technology leader-laggard (follower) framework, which is feasible at least for emerging economies. As a result, countries such as India, South Africa and Brazil can use leap-frog to catch up with technologically advanced nations and reap the benefits of the 4IR. For example, instead of going through the various stages of network development that developed countries did, such as analogue to copper and then to fibre optics, developing countries can choose to install fibre optics directly.

2. Open-source innovations

Open-source technology can provide a means of effective technology transfer and can help developing countries to leap-frog, thereby helping them to catch up with their developed counterparts. It supports the production of goods based on publicly shared designs, promotes innovation and helps countries to move to higher trajectories. Open-source platforms provide the best circumstances that can ease and aid the digital transformation. Apart from being extremely secure any potential security threat could be resolved immediately by the community. Open source is cost-effective as there are no licensing fees and enterprises using the platforms are allowed to innovate on their own if they keep their source code open. This drives innovation, keeps maintenance and development costs low, and provides prolonged utility to the platform.

Table 4: Initiatives promoting open source innovation

Institution	Action
UNCTAD	Adoption of resolution by Economic and Social Council
UN	Open source initiative
UNICEF	Developed tools and platforms

Source: Compiled from various sources.

Various forums have been discussing and promoting the use of open-source innovation (Table 4). UNCTAD has been promoting the use of open-source technologies for many years. The Economic and Social Council has adopted a resolution on open-source technologies for sustainable development (UNCTAD, 2017). The United Nations has undertaken an open-source initiative to make technology, software, and intellectual property available to everyone, including developing countries (Karlitschek, 2019). UNICEF has also developed various tools and platforms to operationalise its commitment to open source, including tools to foster open-source collaboration, agreements to develop new solutions with vendors and collaboration in the open with UNICEF's partners. UNICEF has worked to progressively

operationalise this embracing of open source — an example of which is the UNICEF GitHub organisation (Bedi et al., 2020).

The power of open source has captured the attention of governments as well. The Indian government, for example, is a strong advocate and promoter of open source, having recognised its role in bridging the digital divide in the country. Driving open-source innovation and open application programming interfaces (APIs) has been a central pillar of the Digital India vision (Anandaram, Chetty, Josie and Kripalani, 2021). Many of the government's citizen connect initiatives like *Aarogya Setu*, AADHAR and CoWIN have made use of open-source platforms (Sharma, 2021). This has helped accelerate the development of these programmes and allows others to integrate and build on them.

A centralised repository of such information by the G20 could help developing countries to achieve sustainable, inclusive and resilient recoveries. It could potentially accelerate innovation and discovery across sectors associated with the United Nations Sustainable Development Goals (SDGs) while minimising legal or financial impediments.

3. Regulatory framework

"Data free flow with trust" (DFFT) – which seeks to enable the cross-border free flow of data while addressing concerns over privacy, data protection, intellectual property rights and security – has been a priority for global digital policy coordination since the G20 first raised it during the Japanese presidency of the G20 in 2019. Further, the Italian presidency in 2021 underscored the importance of enhancing regulatory frameworks for workers on digital platforms, which have seen a monumental rise during the 4IR. Data, which is widely regarded as the oil of the 21st century, has seen an exponential rise with global digitalisation. The production and storage of data in such large quantities is fraught with security challenges, especially in an increasingly connected world. Leakage or theft of data could lead to misuse and distort the growing trust in digital platforms.

The policymaker's challenge is to find the balance between consumer privacy and cybersecurity while benefitting from free flow of data, including increased and inclusive digital trade. In this direction, the G20 should promote data localisation while also coming up with an international regulatory framework governing cross-border data flows that balances privacy, use, and safety while also providing flexibility, allowing countries with varying levels of readiness and capacity with necessary policy space.

Countries are increasingly introducing personal-data protection frameworks. Continued dialogue to achieve greater interoperability between these frameworks, notably in the Organisation for Economic Cooperation and Development (OECD), could help provide useful guidance for the trading community. In turn, trade can help to provide the impetus and incentives for regulators to find commonalities across their different approaches, to support a global digital ecosystem (Casalini and López-González, 2019). There are a number of countries that are using data regulation for industrial policy purposes. Bringing policies under the aegis of trade agreements to ensure that approaches remain transparent, non-discriminatory and least trade restrictive in pursuing the stated objectives might help contest these practices. As more countries rely on adequacy or equivalence assessments by public or private bodies, there might be scope to exchange information and views on the processes through which these are established. While this paper takes a trade perspective, interoperability between different data-protection systems can be important not simply for trade but, equally, for ensuring that public policy objectives such as privacy and security can be met in digital world.

The G20 can follow the Asia-Pacific Economic Cooperation (APEC) Privacy framework-Cross Border Privacy Rules (CBPR) system, which identifies best practices that each member country can tailor to its domestic legal system and allow for interoperability between countries. The scope and implementation mechanisms under the CBPR can vary according to each member country's laws and regulations and provide flexibility for governments to design national privacy approaches. If a government joins the CBPR system, not every domestic organisation is required to join; however, becoming a member of the CBPR may benefit an organisation engaged in international trade by indicating to customers and partners that the organisation values and protects data privacy (Fefer, 2020). With certified enrolment in the CBPR, organisations can transfer personal information among participating economies and be assured of compliance with the legal regimes on both sides of the trade.

We recommend that World Trade Organisation (WTO) law incorporate a horizontal obligation enabling cross-border data flows for purposes of conducting business transactions and prohibiting data localisation measures (Mitchell and Mishra, 2019). Privacy is a prerequisite for instilling greater digital trust. The current General Agreement on Trade in Services (GATS) framework allows an exception for privacy measures, but this exception is insufficient as "data-source countries" are unlikely to "accept one-sided limits on their right to protect privacy". In other words, to enable cross-border data flows, both data-source and destination countries should have effective privacy frameworks. Therefore, WTO law should

require all members to adopt a basic regulatory framework for protection of personal information as privacy protection is fundamental for ensuring the free flow of data. Members should adopt a mandatory cooperation mechanism for addressing the transnational aspects of online consumer protection, including information-sharing and providing assistance for cross-border enforcement of consumer protection laws. Countries should adopt measures that they consider appropriate and necessary to protect the personal information of users.

4. Labour force preparedness: Up-skilling and re-skilling

The 4IR impacts flexibility, working time, health, demographics and private life. This amounts to a significant transformation in jobs and skill profiles. Unlike the clear division of labour in industries like manufacturing and vertical and rigid organisational structures, there is going to be new structural set-ups requiring more decision making, coordination, control and support services. There will also be a need to coordinate between virtual and real machines and plants in production-management systems. Developing countries should try to develop resilient and adaptable labour markets that allow workers and countries to manage the transition to this new technological age with the least disruption. Investment in education and training should be made to skill and re-skill young people for the jobs of the future and for equipping them with the right type of skills to successfully navigate through an ever-changing, technology-rich work environment.

As part of upgrading educational and pedagogical methods to usher in the 4IR, digital-learning platforms assume great importance. The onset of the pandemic reinforced this trend. Taking advantage of digital-learning platforms, online open courseware called Massive Open Online Courses (MOOCs)) have become a practical method to address the inefficiency associated with conventional learning platforms. Many private-sector companies have the unique value proposition of housing online training courses aimed at supporting the workforce development needs of current employees. With the understanding that this training is proprietary, and often tailored to the specific customer and employee needs of the company, open-source online courses also exist and can be leveraged for the specific business needs of the future. These could be particularly effective if accompanied by mentorship, coaching and hands-on learning. Working with already established mobile-enabled platforms, such courseware could be leveraged to promote cross-cultural education and global connectivity, further supporting companies' development of fractured work cultures (Deloitte, 2018).

While online platforms support localised versions of the transactional gig economy, several initiatives have recognised the need for skills-matching platforms that support low-skill jobs or resource needs in geographically dispersed communities. Some platforms target workers in informal or low-paid sectors allowing them to post digital CVs and receive real-time job listings via SMS, creating a gig-economy platform for traditionally disconnected labour markets. These platforms also allow automatic matching of available opportunities and workers based on posted skills and location data. There is widespread agreement on the benefits of the digital labour platforms due to their ability to address labour market inefficiency on a global scale, facilitate job matching in local markets, reduce recruiting time, and create opportunities for workers to reach new markets and audiences. There are potential obstacles that could hinder long-term global adoption such as youth access to mobile phone data and affordability, understanding the target population's literacy level, local use of multiple languages or dialects, potential for geographical and age discrimination in the absence of globally standardised signalling and credentialling, and the need to gain a critical mass of youth users to gain credibility.

The 4IR has posed challenges and opportunities for developed and developing countries alike. However, evidence from the past suggests that industrial revolutions have generally nurtured more growth in the developed economies than in developing economies. The latter are also more vulnerable to the threats of the 4IR. Nonetheless, new technological advances - AI, 3D printing, robotics - offer the prospects of positive impacts on all countries, and G20 nations in particular, irrespective of their level of development, need to undertake appropriate measures to promote the 4IR and address the potential threats to national security through data protection and localisation.

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