LPEM-FEBUI Working Paper - 074
December 2022

ISSN 2356-4008

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LPEM-FEB UI Working Paper 074

Chief Editor : Riatu M. Qibthiyyah
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LPEM-FEB UI Working Paper 074, December 2022
ISSN 2356-4008

Bending the Moral Arc of Technological Adoption in Indonesia Towards Good

Ibrahim Kholilul Rohman[1,★], and Maria Monica Wihardja[2]

Executive Summary
In Indonesia, digital technology and digitalization are seen as solutions to economic development challenges and future transformation towards more prosperous society. Digital technology is a double-edged sword as in most cases it entails both benefits and drawbacks. Due to data limitations, there are no easy means to evaluate the externalities – both positive and negative – caused by digital transformation. This essay proposes a new framework to analyse the impacts of digital economy by extending the G20 Toolkit framework for Measuring the Digital Economy to indicators that are in line with the Sustainable Development Goals. Applying this framework to the Indonesian context, using ex-post (actual) and ex-ante (projected) real-life examples, the government could consider limiting the retail access to cryptocurrencies, requiring customer suitability tests, and/or restricting the use of leverage and credit facilities for crypto trading. In the case of ride-sharing platform economy, the Indonesian government could consider monitoring service fees charged to online retailers by vertically integrated digital platforms and intervene if they are deemed to harm consumers and online retailers.

JEL Classification: L86; N70; O14; Q55
Keywords
digital technology — impact assessment — SDG

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1. Introduction

> *Technological innovation is not inherently 'good' or 'bad'. Some changes yield broad benefits for society, but others may benefit the few at the expense of the many, and most will bring a mix of benefits, costs, and complications. (Raghuram G. Rajan, 2022)*

At the onset of rapid digital transformation, everyone is seemingly riding on an express train - only that each is not exactly sure in which direction the train is going, with no way to stop the train. Like any other technology, digital technology is a double-edged sword as in most cases it entails both benefits and drawbacks. Unfortunately, there are no easy means to evaluate the externalities – both positive and negative – caused by digital transformation.

This problem is partly due to data limitations. The current conceptual treatment of the System of National Accounts worldwide only recognizes transactions in which a monetary transaction occurs. In a digital economy, consumers are often given free access to services in exchange for access to their personal data. The value of these data is monetized elsewhere over time, some of which are captured in other forms of services (e.g. advertising). Also, there is a lack of an internationally-agreed approach to measuring the flows of digital platform activities, which makes the digital economy less visible in our national statistics.[1]

The consequence of this is a biased public perception about the impacts of digital transformation, based on incomplete information, mostly in favour of digital transformation. Literatures highlighting the potentials of digital technology to accelerate development, including how to harness digital technologies to achieve Sustainable Development Goals (SDG) (see, for example, International Telecommunication Union [ITU], 2021), are bountiful. However, we can only bend the arc of digital transformation towards good if these potentials are weighed against the risks.

In Indonesia, digital technology and digitalization are seen as the absolute solution to economic development challenges, from low productivity to inequality, and future transformation towards more prosperous society. In many official documents and development plans, technological adoption and digitalization are seen as a panacea to economic and social challenges without enough deliberation and recognition of possible and potential negative externalities.

To exemplify, the National Medium-Term Development Plan for 2020–2024 (*Rencana Pembangunan Jangka Menengah Nasional*) reiterates that:

> *Digitization, automation, and the use of artificial intelligence in economic activities will increase productivity and efficiency in modern production, as well as provide convenience and comfort for consumers. Digital technology also helps the development process in various fields, including education, governance, financial inclusion; and also helps with the development of micro, small, and medium enterprises (or UMKM)*

[1] The European Union for instance under the PREDICT database puts Nomenclature of Economic Activities (NACE), like ISIC, 62 (Computer programming, consultancy and related activities) and 631 (Data processing, hosting and related activities; web portals) to mimic the evolvement of digital platforms. But it might not be sufficient to portray the real multi-layered services in the context of platform economy (see: https://joint-research-centre.ec.europa.eu/predict/ict-sector-analysis-2022/data-metadata-2022_en).

Similarly, the document produced by the Ministry of Communications and Informatics (kominfo.go.id, 2021; Kompas.com, 2020), the Roadmap of Indonesia's Digital 2021–2024, dotes on digital technology. There is nowhere in these official documents that explicitly mention or foresees some of the risks and drawbacks of digital transformation although the effort by the government to prepare a digital society and promote digital literacy might be linked to some of these risks and drawbacks.

This paper attempts to provide a simple framework to assess the positive and negative impacts of digital technology. The framework is based on the OECD framework of digital economy commissioned by and agreed upon at the G20 Saudi Arabia Summit in 2020 with some modifications. It links digital technology with SDG framework. The authors are not aware of any existing literature that has attempted this approach. Note that the framework is not intended to judge whether a particular technology is good or bad. Yet the framework can help policymakers to steer the direction and speed of digital transformation. This paper applies the Indonesian context to the proposed framework using ex-post (actual) and ex-ante (projected) real-life examples. We use the cryptocurrency industry as an ex-ante analysis of digital technological adoption in Indonesia, while the ride-sharing platform economy – a more mature sector - is used as an ex-post analysis.

2. A Framework for Better Technological Adoption

The G20 has made a tremendous effort to measure the digital economy across member nations. One significant milestone was the development and endorsement of the *G20 Toolkit for Measuring the Digital Economy* under the Argentinian G20 Presidency in 2018 (G20 Digital Economy Task Force [G20 DETF], 2018). The Toolkit identified key actions by G20 members to make statistical systems more flexible and responsive to the new and rapidly evolving digital era. It recommended working 'towards improving the measurement of the digital economy in the existing macroeconomic framework', e.g., by developing specific national accounts for the digital economy.

The Toolkit also recognizes that the lack of industry and product classification for internet platforms and associated services makes it challenging to measure the size and impacts of the digital economy. Mismeasurement in the digital age risks flawed estimates of output and multifactor productivity. For example, the current conceptual treatment of the System of National Accounts worldwide only recognizes transactions in which a monetary transaction occurs. OECD report, *Measuring the Digital Transformation: A Roadmap for the Future* (OECD, 2019), also recommends making digital transformation visible in economic statistics to understand the economic impacts of digital change.

A Roadmap Toward a Common Framework for Measuring the Digital Economy was delivered under the Saudi Arabian G20 Presidency in 2020 (OECD, 2020). The roadmap provided the definition of the digital economy (see Annex 1) and a set of indicators for measuring the jobs, skills and growth within it (see Annex 2). The OECD Roadmap provides indicators on jobs, skills and growth to measure the size of a digital economy (Annex 2).

All this effort remains work-in-progress.

In this paper, we try to extend the G20 Toolkit framework to include an impact-assessment framework to measure the impacts of digital economy, using a set of indicators in line with the 17 goals of SDG. Some SDG indicators are mapped as 'positive' effects of digital transformation, as these variables are the most obvious mainstays and objectives of digital transformation, namely productivity, value added and growth, jobs and earnings, and skill, knowledge and data generation (the rows in Table 1), while the remaining SDG indicators are mapped as 'negative externalities' or side effects (the columns in Table 1) to give nuances to the positive externalities as indicated in the OECD Roadmap.

Table 1 is an impact assessment framework for digital transformation that is presented to accord the SDG framework with some adjustments. Thus, appropriate technology aims at maximizing the positive externalities while acknowledging and addressing potential negative externalities. For example, job creation in digital-intensive sectors and information industries could exacerbate income inequality as more educated workers benefit more from digital transformation (World Bank, 2021).

The concordance between the framework and SDGs are as follows on Table 2.

3. Case Study: Cryptocurrencies and Ride-hailing

3.1 Cryptocurrency: Benefits and Downsides

Blockchain-powered cryptocurrency is an example of an innovative technology that has potential negative externalities despite its many potentials. Cryptocurrencies currently bypass the traditional banking system and its transaction costs, potentially contributing to efficiency in the global financial industry and innovation.

Based on the data from the Commodity Futures Trading Regulatory Agency (CpFTRA), 7.5 million Indonesians were engaged in crypto transactions in 2021, an increase of 87.5 percent compared to 2020. In terms of transaction volume, the crypto transactions have reached IDR 478.5 trillion in July 2021, or about six percent of the total money supply of Bank Indonesia. However, the value of crypto transactions in 2021 increased by 636 percent compared to 2020.

Yet, Indonesia is still in the incipient stage of adoption, mainly engaging at the very end of value creation of buying and selling the currency, in contrast with the United States, China, Kazakhstan, Canada, Russia, Germany, Malaysia, Ireland, and Iran who are leading the Bitcoin mining hash rate[2] in 2022. We take an ex-ante approach to project potential impacts if or when Indonesia joins the parade of crypto-mining nations.

To map these positive externalities against the inequality aspect, crypto can be used to increase economic and social inclusion. The development of a global crypto industry has

[2]The Bitcoin hash rate refers to the amount of computing and process power being contributed to the network through mining. Source: https://www.sofi.com/learn/content/bitcoin-hash-rate/.

Table 1. Matrix Based on the G20 Digital Economy Framework and SDG

		Negative Externalities						
		Inequality (including geography, gender, socio-economic status)	Environmental Externalities	Financial and Macroeco-nomic Instability	Lack of Competition and Concentrated Market Structure	Breaches to Safety and Security	Political Instability	Detrimental Consumer Psychology
Positive Externalities	Productivity, Value Added and Growth	a	b	c	d	e	f	g
	Jobs and Earnings	h	i	j	k	l	m	n
	Skill, Knowledge and Data Genera-tion (Innovation)	o	p	q	r	s	t	u

Table 2. How the SDGs are Mapped Into the Proposed Digital Transformation Impact Assessment Framework

Framework G20-toolkit	SDGs
Productivity, value-added and growth	Economic growth; industry, innovation, and infrastructure
Job and earning	Decent work
Skill, knowledge, and data generation	Quality education
Inclusion	No poverty and zero hunger; gender equality; reduced inequality
Environment	Clean water and sanitation; affordable and clean energy; sustainable cities and communities; responsible consumption and production; climate action, life below water and life on land;
Financial and macroeconomic stability	Economic growth
Competition and market structure	Industry, innovation and infrastructure, peace and justice strong institutions
Safety and security	Peace, justice and strong institutions
Political stability	Partnerships to achieve the goal
Mental well-being/consumer psychology	Good health and well-being

created jobs (estimated at more than 2,000 in 2017), though the number is miniscule compared to employment in other sectors (Hileman & Rauchs, 2017). Crypto may also potentially generate earnings for investors, especially from an increase in market value. These benefits are depicted in both rows of productivity and jobs in Table 1. On top of conventional digital payment, crypto-backed apps can be used, for example, to send remittances or to send universal basic income to refugees in camps.[3] Hence, crypto may contribute on improving inclusion.

However, some studies indicate that cryptocurrencies have alarming environmental effects. For example, to mine and calculate, Bitcoin uses about 150 terawatt-hours of electricity annually, or around 0.55% of global electricity production – more than the annual energy consumption of Argentina (Hinsdale, 2022; Carter, 2021). The associated carbon dioxide emissions are comparable to the entirety of Greece's annual emissions (Hinsdale, 2022). Hence, though there are positive effects related to efficiency, income generation and innovation, there are potentially environmental costs.

Bitcoin is not mined in Indonesia but in countries that are doing so the environmental effects are a concern. The United States, China, Kazakhstan, Russia and Canada were the largest contributors in Bitcoin mining as of January 2022 (Statista, 2022). In China, the environmental concerns have led to a crackdown on crypto mining since May 2021 and some provinces, including Sichuan and Yunnan, have banned crypto activities from accessing hydropower (Davies, 2022). In Kazakhstan, the environmental issue is also on the rise as mining is powered mostly by coal plants. These concerns are depicted in the 'Environmental Externalities' column of Table 1. In the US, though the current legislation still focuses on consumer protection, environmental issues are being discussed.

Moreover, Hayes (2017) found that the value appreciation of Bitcoin may be tightly linked with speculation, which can distort and threaten the existing financial system. Yermack (2015) found that Bitcoin's daily exchange rates exhibit virtually zero correlation with widely used currencies and with gold, making it useless for risk management and exceedingly difficult to hedge. This might create risks to financial and macroeconomic stability, which corresponds to the 'Financial and Macroeconomic Instability' column of Table 1.[4]

In addition, private cryptocurrencies bypass governments (meaning tax evasion is a possibility) and regulations (e.g., capital flows), and are as accessible to malign users (e.g., money launderers) as to benevolent users (Rogoff, 2022). Crypto transactions are traceable through the blockchain ledger, but users usually use pseudonyms and cannot be identified without additional information. These concerns are reflected in the 'Breaches to Safey and Security' column of Table 1.

Thus by weighing the positive externalities in the rows against the negative externatlities in the columns of Table 1, related stakeholders might more justly assess the potential net effect of cryptocurrencies for the society.

Since January 2022, Monetary Authority of Singapore (MAS) has restricted the promotion of cryptocurrecy ser-

[3]For example, many Venezuelan migrants in Colombo send money home using the crypto-based app, Valiu. The Refugee Integration Organization had successfully distributed USD 71,000 as a daily USD 1.50 universal basic income to 2,500 refugees by August 2021.

[4]Crypto may become even riskier when introduced in countries that are already unstable economically. Venezuela introduced a government-backed cryptocurrency, Petro, which may complicate the economic turmoil coming mostly from hyperinflation and broad US economic sanctions. Some, however, believe crypto fills the policy gap in the hyperinflation-stricken economy. Venezuela's opposition-run congress called Petro, whose issuance is backed by the Venezuelan oil, 'illegal debt issuance by a government desperate for cash' (Al Jazeera, 2018).

vices at public spaces and at the time the article is written, MAS is considering further measures to add frictions on retail access to cryptocurrencies. According to Ravi Menon, Managing Director of MAS, "cryptocurrencies are actively traded and heavily speculated upon, with prices that have nothing to do with any underlying economic value related to their use on the distributed ledger... Many consumers are still enticed by the prospect of share price increases in cryptocurrencies and seem to be irrationally oblivious about the risks of cryptocurrency trading." (MAS, 2022).

To conclude, in the case of crytpcurrencies, like Singapore, the government might consider limiting the retail access to cryptocurrencies, requiring customer suitability tests, and/or restricting the use of leverage and credit facilities for crypto trading (MAS, 2022). For the time being, the government of Indonesia allows crypto transactions for storing value, however, given the high volatility of prices and risks of trading in cryptocurrencies, the government might consider the abovementioned measures. Banning completely retail access to cryptocurrency is almost impossible given the borderless cryptocurrency world (MAS, 2022).

3.2 Ride-sharing Platform Economy: Benefits and Downsides

Another example of technology with both positive and negative externalities is the ride-sharing economy (including online food delivery) in Indonesia. Ride-sharing platform economy is a mature industry in Indonesia. Gojek, one of Indonesia's most widely used ride-sharing platforms, and its GoTo Financial ecosystem[5] are estimated to have accounted for 1.6% of Indonesia's GDP in 2021 (Lembaga Demografi, Fakultas Ekonomi dan Bisnis, Universitas Indonesia [LD FEB UI], 2021). Another study found similarly for Grab, another widely used ride-sharing app in Indonesia (Tenggara Strategics, 2019). Studies have also found that the technology has helped create and upgrade jobs and improve digital skills (see, for example, World Bank, 2021). Ride-sharing platform economy in Indonesia contributed to productivity, value added and growth; jobs and earnings; and skill, knowledge and data generation. These aspects are all reflected in all the three rows of Table 1: "Productivity, Value Added and Growth", "Jobs and Earnings", and "Skill, Knowledge and Data Generation (innovation)".

However, concerns exist and must be addressed. A World Bank study (2021) found that e-commerce may lower inflation in commodities intensively traded online. However, over time, this reduction in inflation may be attenuated, offset altogether or even reversed by increasing service fees charged to merchants, including food vendors, by platforms. Platforms usually charge no service fee during a promotion period but charge an increasingly greater portion of sales as a service fee as time progresses. This means online prices charged by the merchants and food vendors could increase by about 20% (in some cases even 30%) to recover those service fees. This excludes listing fees, charged per item offered by the platforms, which can add another 15% to prices.[6] This concern corresponds to the "Financial and Macroeconomic Instatbilty" column of Table 1. However, the risk of macro instability due to higher inflation is not of immediate concern although this inflationary tendency may be exacerbated by other issues such as algorithmic (tacit) collusion on prices among digital platforms (OECD, 2017), which indirectly relates to the "Breaches of Security and Safety" and "Lack of Competition and Concentrated Market Structure" columns of Table 1.

Increasing service fees charged by platforms is one sign of a concentrated market structure. The platform economy naturally has a duopsony or oligopsony market structure because of the network effects, which sees customers and vendors joining platforms with the largest number of existing customers and vendors. This has resulted in race-to-the-bottom tariff-setting in the case of a ride-sharing ecosystem or service fees increases in the case of online food delivery platforms.

A duopsony or oligopsony market structure may weaken the bargaining power of drivers and food vendors on these platforms. This market structure combined with the network effect of a platform economy gives digital platforms big market power, potentially at the cost of workers' welfare (Zeng Hongde, 2020). At the global level, the OECD and others have found emerging signs indicating weaker dynamics in the platform economy since approximately 2018: increasing markups by firms, fewer start-ups, an acceleration of Merger and Acquisition activity by digital firms and increasing share of aggregate revenues by the largest firms (Boone et al., 2019). These are all issues related to the "Lack of Competition and Concentrated Market Structure" column of Table 1.

The big market power that digital platforms have potentially make gig workers vulnerable to platforms' moves to reduce incentives or tariffs, or increase service charges. Moreover, asymmetries of information between platforms – who monitor, track and manage workers' data - and gig workers, and the use of algorithm management as well as behavioural economics to influence working conditions and working hours through incentives, may leave gig workers with less autonomy over their time and working conditions (Zeng Hongde, 2020; Octavia, 2022). In Indonesia and Singapore, gig workers have been found to work very long hours (World Bank, 2021; Zeng Hongde, 2020).

In 2017, the Government of Indonesia set maximum and minimum tariffs for online ride-hailing services to ensure a level playing field with offline transport services and address complaints of undercutting.[7] Although a cost and benefit study needs to be conducted first, the government might consider monitoring service fees charged to online retailers by vertically integrated digital platforms and intervene if they are deemed to harm consumers and online retailers.

4. Conclusion

This paper is an attempt to create a framework that assesses both positive and negative externalities of digital transformation. Using one ex-ante (cryptocurrency) and one ex-post (ride-sharing platform economy) real-life example of digital technological adoption in Indonesia, we show that in both

[5] In 2021, Gojek merged with Tokopedia, an e-marketplace, to form GoTo.

[6] A merchant can improve their visibility by paying a higher listing fee.

[7] See: https://sg.news.yahoo.com/indonesia-sets-tariff-ranges-online-car-hailing-services-105940537--finance.html.

mature and nascent digital sectors, externalities associated with digital transformation are neither absolutely good nor bad. This more nuanced narrative of digital transformation could be considered in government's official documents and roadmaps. What is of greatest concern is that while the positive and negative externalities of digital transformation are becoming more evident, we have few or no strategies or means with which to collect data and quantify the magnitude of these externalities. Coming up with a comprehensive strategy to monitor the impacts of these externalities could be the next action plan for Indonesia's digital transformation agenda.

Although standards and frameworks to define and measure the digital economy exist, many countries, including Indonesia, still lack infrastructure, mechanisms, a regulatory framework, technical capacity and institutions to collect data and measure effects. Indonesia has made progress on data collection. For example, the national statistics agency began in 2019 to conduct a national e-commerce survey and has incorporated internet and ICT use in its biannual labour force and national socio-economic surveys since 2018 and 2007 respectively, as well as in its decennial firm census since 2016. Under the Ministry of Trade, an ongoing revision to Trade Ministerial Decree No.50, 2020 may help the country better monitor e-commerce by requiring e-commerce platforms to share some information with the government although there seems to be little trust to share confidential corporate information with the government.

Even with evidence of the effects of digital economy, across the world, we are witnessing that the road to a just, fair and inclusive digital transformation may be long and winding and the role of money politics by technology giants in some countries makes the sector more difficult to regulate (Rogoff, 2022). An overarching strategy is needed for Indonesia, rather than reactive and piecemeal solutions, since digital technologies are here to stay, and their effects are deep, widespread and in some cases irreversible and inescapable. Otherwise, it may be too late to bend the moral arc of digital technologies towards good.

Acknowledgement

The authors would like to thank Cassey Lee, Siwage Dharma Negara, Joanna Octavia, and Muhammad Yorga Permana for their constructive comments.

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Annex

Annex 1: G20 Definition of Digital Economy

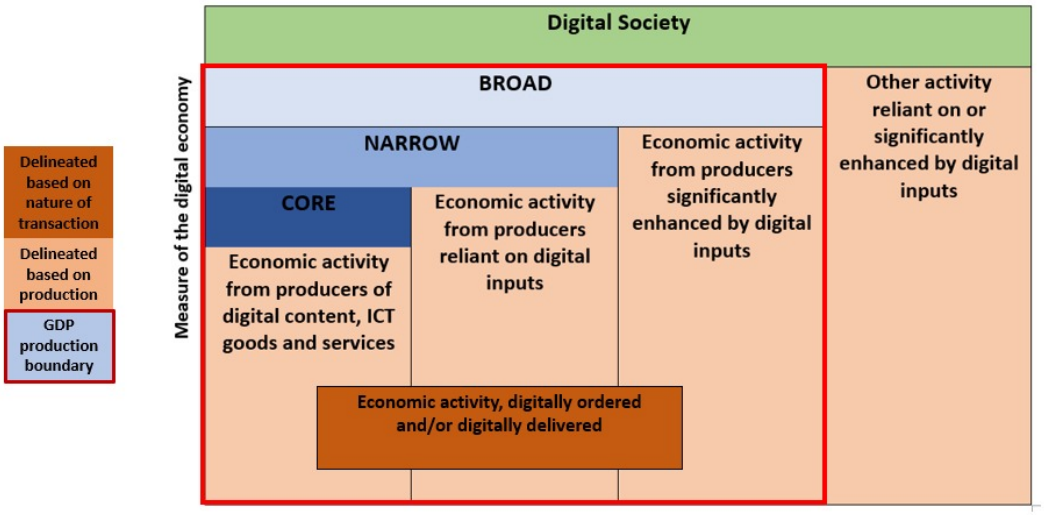

Figure 1. G20 Tiered Definition of Digital Economy
Source: OECD (2020, p. 115)

The Digital Economy incorporates all economic activity reliant on, or significantly enhanced by the use of digital inputs, including digital technologies, digital infrastructure, digital services and data. It refers to all producers and consumers, including government, that are utilizing these digital inputs in their economic activities.

Although relatively broad, this definition will, combined with the various tiers underpinning it, provide G20 members with a consistent and consensual framework to guide policy making providing a logical standard by which to compare indicators.

While discussed further in section two, the tiers underpinning the proposed definition are the following:

1. The Core measure of the Digital Economy only includes economic activity from producers of ICT goods and digital services.
2. The Narrow measure includes the core sector as well as economic activity derived from firms that are reliant on digital inputs.
3. The Broad measure includes the first two measures as well as economic activity from firms significantly enhanced by the use of digital inputs.
4. The final measure of Digital society extends further than the Digital Economy and incorporates digitalized interactions and activities not included in the GDP production boundary, such as the use of free digital platforms (including free public digital platforms). While these interactions are not explicitly considered part of the Digital economy per se, this activity is important for effective digital policy by government.
5. An additional measure covers all economic activity that is digitally ordered and/or digitally delivered. It be considered as an alternative perspective of the Digital Economy, delineated based on the nature of transactions. Rather than splitting the economy based on firms' output or production methods, this measure focuses on ordering or delivery methods, regardless of the final product or how it is produced.

Annex 2: G20 Indicators in the Digital Economy Proposed for Joint Monitoring

Annex Table 1. G20 Indicators on Jobs, Skills, and Growth in the Digital Economy

Section	Indicator name	Data source(s)	Underpinning data source
Jobs	2.1.1 Jobs in digital-intensive sectors and Information Industries	OECD Structural Analysis (STAN) Database based on National Labour Force Surveys	National Accounts sources / Labour force surveys
	2.2.1 Jobs in ICT task-intensive and ICT-specialist occupations	European Labour Surveys and other sources	LFS
	2.2.2 ICT professionals and technicians by gender	International Labour Organization (ILO) based on national Labour Force Surveys	LFS
Skills	3.1.1 Selected ICT skills by gender	ITU World Telecommunication/ICT Indicators database and OECD ICT Access and Usage by individuals database	Household and Individuals ICT usage surveys/modules in LFS
	3.2.1 ICT task intensity of jobs by gender	PIAAC database	PIAAC skills survey module
	3.3.1 ICT usage in school	OECD Programme for International Student Assessment (PISA) Database	PISA assessments
	3.3.2 Students' reported ICT capabilities, by gender	OECD PISA Database	PISA assessments
	3.4.1 Tertiary graduates in natural sciences, engineering, ICTs, and creative and content fields of education	OECD Education Database	Administrative registers and/or survey sources
	3.4.2 Tertiary graduates in NSE & ICT, by gender	OECD Education Database	Administrative registers and/or survey sources
Growth	4.1.1 Value added by information industries	OECD STAN Database	National Accounts sources
	4.1.2 Information industry-related domestic value added	OECD Inter-Country Input-Output (ICIO) Database and Trade in Value Added (TiVA) Database	National Accounts sources
	4.1.3 Value added by digitally intensive sectors	OECD STAN Database and OECD ICIO Database	National Accounts sources
	4.2.1 ICT investment by asset	OECD, Annual National Accounts Database	National Accounts sources
	4.2.2 ICT contribution to labour productivity growth	OECD Productivity Statistics Database	National Accounts sources
	4.3.1 ICT goods exports and imports	UNCTAD Information Economy database	Merchandise trade data
	4.3.3 Digitally-deliverable services exports and imports	UNCTAD Information Economy database	Trade in services data

Source: OECD (2020, p. 107)

Note: NSE is natural sciences and engineering; PIAAC is the Programme for the International Assessment of Adult Competencies; PISA is the Programme for International Student Assessment; LFS is the Labour Force Survey

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