

Annex A:

Measuring the Digital Economy

In order to plan and make more informed decisions, policymakers need a clear, well-elaborated measurement framework supported by reliable statistics that are regularly updated with data comparable across sectors and economies. This is all the more critical in light of the growing role of the digital economy in many economies and the opportunities and challenges it presents. Achieving this goal will entail consistency in data collection and analysis, cooperation between statistical agencies, and agreement on common standards and practices at the regional and global levels, among others. Efforts to measure the digital economy must overcome fundamental disagreements on the definition and scope of the digital economy, and serious technical challenges. Even if achieving comparability is not feasible in the short term, economies can help to overcome these measurement challenge by providing details about what statistics they are measuring and how they have been derived.

The absence of consensus on a definition of the digital economy presents serious challenges for efforts to measure it, as it raises a number of important questions: (1) should the digital economy be defined narrowly as those activities facilitated by online platforms, such as online purchasing and online movie streaming?; (2) or should it instead be defined broadly as all the sectors that have incorporated data and the Internet into their production processes?; (3) the term digital sector has been mentioned frequently, but what is it exactly and is it equivalent to the digital economy?; (4) what is its relation with the ICT sector?; (5) what is its relation to e-commerce, which is arguably only one aspect of the digital economy?

Definitions aside, there are a range of challenges that pertain more to the technicalities of the measurement itself. Some of these relate to existing issues that include limitations to the current national accounts framework and challenges in measuring services, while others relate to newer issues such as measuring certain digital-related activities. Although it is important to accurately measure digital and digitally-facilitated flows,¹ monitoring the digital transformation is equally important as it allows policymakers to better understand how digitalisation is changing the economy and the society as a whole and to devise appropriate policy responses. In this regard, gaps and challenges remain, despite there having existed for some time efforts by economies and various organisations to collect and analyse indicators to monitor the digital transformation.²

Last but not least, the advent of the digital economy has brought with it new business models that have fundamentally changed the way that business is conducted and the products and services that are traded. In this environment, it is important to be able to monitor policies and regulations with implications for the digital economy. The next section will review some of these challenges in greater detail. A number of organisations have made significant efforts to measure different aspects of the digital economy, including digital flows, digital transformation and how laws and regulations can positively and negatively affect the digital economy. Where current information is available, this annex will refer to some of the ongoing work done by these organisations.

Definition and measurement

Definition and measurement go hand-in-hand. Definition provides the scope of coverage and allows statisticians to come up with a corresponding measurement framework. A review of ongoing work done by various organisations on the digital economy shows them clearly defining what they are measuring and acknowledging the limitations of the approaches taken before proceeding to collect and analyse the relevant data. For instance, the United States Bureau of Economic Analysis (BEA) published a study in 2018 to estimate the size and contributions of digital activities currently embedded in the existing national accounts, paving the way for the construction of a new digital economy satellite account. In the study, the bureau first developed a conceptual definition of the digital economy, including three

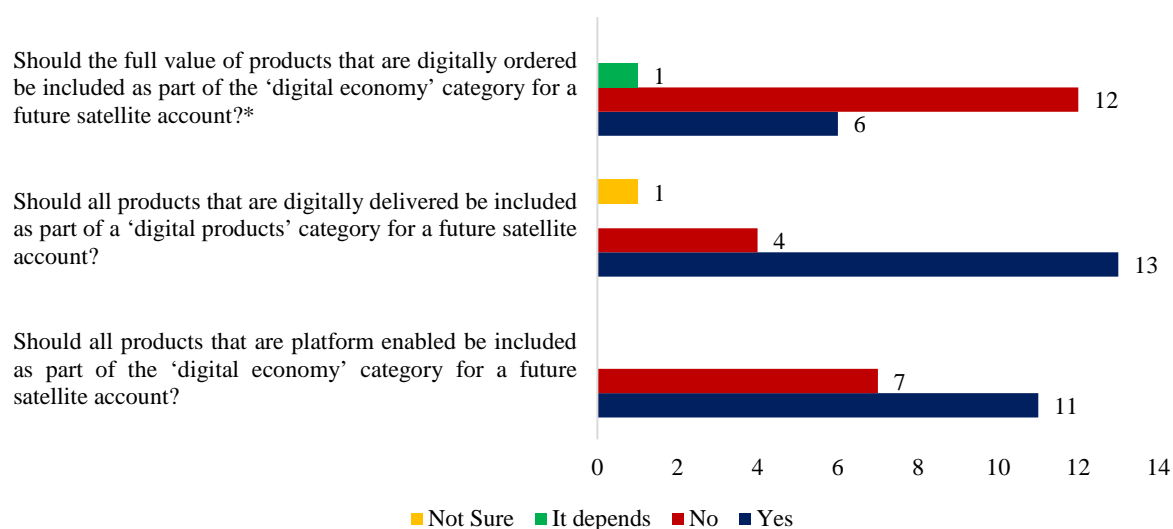
¹ For the purpose of the AEPR, ‘digital and digitally-facilitated flows’ includes, but are not limited to electronically-delivered goods or services, other types of data flows, and goods sold via e-commerce channels.

² For example, the International Telecommunication Union (ITU)’s percentage of individuals using the internet (details at <https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx>), and the World Bank’s percentage of individuals having mobile money accounts (details at <https://globalindex.worldbank.org/>).

parts: (1) the digital-enabling infrastructure which enables the existence and operation of a computer network; (2) the digital transactions using that system; and (3) the content created and accessed by digital economy users. Using this definition, the bureau then identified the detailed goods and services that should be included in the sphere of the digital economy using its supply-use framework, and then provided its preliminary estimate of the size of the digital economy.³

However, reaching consensus among different stakeholders is not an easy endeavour. As an illustration of the varying opinions, the OECD Informal Group on Measuring GDP in Digitalized Economy conducted a survey on economies' practices and thoughts on the definition and classification of digital economic activities and the statistical challenges of creating a new satellite account.⁴ The survey received 19 responses from task force members. Mixed answers were found for the question 'what is part of the digital economy?' Twelve respondents indicated that they would not record the full value of digitally ordered products as part of the 'digital economy' (Figure A.1). On whether all digitally delivered products should be part of the digital product category, 14 member economies agreed that they should be, while 4 would not include all products. On whether platform-enabled products should be part of the 'digital economy', 11 respondents stated they would include all platform-enabled products, while 7 indicated they would not include all. Views are also divided on whether enabler products such as computers and mobile phones should be regarded as digital economy products.⁵

Figure A.1. Summary of selected OECD survey responses on measuring GDP in a digitalised economy



Note: *One member checked both yes and no

Source: Jennifer Ribarsky, 'Summary of Responses of the Advisory Group: Survey on Digital Economy Typology' (STD/CSSP/WPNA(2017)1, OECD, 22 September 2017), [http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=STD/CSSP/WPNA\(2017\)1&docLanguage=En](http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=STD/CSSP/WPNA(2017)1&docLanguage=En).

³ Kevin Barefoot et al., 'Defining and Measuring the Digital Economy' (Suitland, MD: Bureau of Economic Analysis, 15 March 2018), <https://www.bea.gov/system/files/papers/WP2018-4.pdf>.

⁴ A satellite account is an account that is developed to measure the size of economic sectors that are not defined as industries in national accounts. One example is the tourism sector, which is a combination of industries such as transportation, accommodation, food and beverage services, recreation and entertainment, and travel agencies. Indeed, tourism is the first activity to use worldwide satellite account standards to measure its impact on national economies (see UN World Tourism Organization, 'Basic Concepts of the Tourism Satellite Account (TSA)', accessed 23 August 2019, <http://statistics.unwto.org/sites/all/files/docpdf/concepts.pdf>).

⁵ Jennifer Ribarsky, 'Summary of Responses of the Advisory Group: Survey on Digital Economy Typology' (STD/CSSP/WPNA(2017)1, OECD, 22 September 2017), [http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=STD/CSSP/WPNA\(2017\)1&docLanguage=En](http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=STD/CSSP/WPNA(2017)1&docLanguage=En).

Differing views on the nature and economic value of the digital economy led to variation in the survey responses. For instance, one survey respondent shared that a possible way to define digital products is to ask whether the products would continue to exist without the internet (e.g., internet advertising). In terms of contribution to the overall economy, one economy suggested that there is a need to distinguish between the direct and indirect contribution of digitisation to the economy. Indirect contribution is when an activity is simply facilitated by a digital intermediary while the product or service is produced and traded physically. As an illustration, when booking a flight ticket online, the component of the ticket price should therefore be broken down into direct contribution (e.g., cost of intermediary service) and indirect contribution (e.g., cost of fuel, in-flight service, etc.) to the digital economy. In a similar vein, another economy suggested that two different layers should be measured in any conceptual framework used to estimate the digital economy, each with different statistical interpretations. One layer includes core digital products/industries and the other one includes activities that are facilitated by digitalisation.⁶

The lack of an agreed definition leads to divergence in the measurement frameworks, and affects the comparability of statistics between economies and across years. Based on a broad definition of the digital economy, the China Academy of Information and Communications Technology (CAICT) estimates the size of China's digital economy to be RMB 31.3 trillion (around USD 4.5 trillion) in 2018. This accounted for 34.8 percent of China's GDP, up from 32.9 percent in 2017.⁷ Using a narrower definition, the US BEA estimates the size of the digital economy in the US to be USD 1.35 trillion in 2017, making up 6.9 percent of its nominal GDP.⁸ Due to the use of very different methodologies, it would be premature to conclude that China's digital economy is more than three times the size of the US digital economy. For frameworks to be comparable, it is important to look at what industries and products are included as well as the measurement methodology.

Recognising that there is currently no clear and agreed definition of the digital economy and coming up with one may take some time, an approach taken by several economies and organisations is to limit the scope to certain technology-intensive sectors (e.g., ICT), e-commerce, or digital trade. The idea is two-fold: (1) narrowing the scope simplifies the measurement issue; and (2) since statistics pertaining to some sectors are more widely available, they can serve as a proxy and therefore can be indicative of the broader digital economy. For example, a recent study by the IMF on measuring the digital economy focuses on the digital sector, defined as comprising online platforms, platform-enabled services, and suppliers of ICT goods and services.⁹ E-commerce can also be used as a proxy to estimate the size of the digital economy. It is defined by the OECD as the 'sale or purchase of goods or services, conducted over computer networks by methods specifically designed for the purpose of receiving or placing of orders'. The products or services are digitally ordered but can be paid for or delivered either digitally or physically.¹⁰

Using narrower terms and sectors as proxies to measure the digital economy is, however, less than ideal for several reasons. First, some proxies such as digital trade suffer from the same lack of an agreed definition as the digital economy itself.¹¹ Second, there is a serious question as to whether well-defined sectors such as the ICT sector are a good proxy for the digital economy. For example, the definition of ICT hardware manufacturing includes products such as rabbit antennae and video cassette recorders

⁶ Ribarsky.

⁷ Sohu News, '数字经济, 7本白皮书, 10大亮点 | CAICT 核心成果分享' [Digital Economy, 7 White books, 10 Highlights | Core Findings Shared by CAICT], 6 May 2019, www.sohu.com/a/312039707_735021.

⁸ US Bureau of Economic Analysis, 'Measuring the Digital Economy: An Update Incorporating Data from the 2018 Comprehensive Update of the Industry Economic Accounts' (Suitland, MD: Bureau of Economic Analysis, April 2019), https://www.bea.gov/system/files/2019-04/digital-economy-report-update-april-2019_1.pdf.

⁹ Marshall Reinsdorf and Gabriel Quirós, 'Measuring the Digital Economy' (Washington, DC: IMF, 28 February 2018), <https://www.imf.org/en/Publications/Policy-Papers/Issues/2018/04/03/022818-measuring-the-digital-economy>.

¹⁰ OECD, 'OECD Glossary of Statistical Terms: Electronic Commerce', updated 17 January 2013, <https://stats.oecd.org/glossary/detail.asp?ID=4721>.

¹¹ Peter Lovelock and Australian APEC Study Centre, 'Digital Economy: Measurement, Regulation and Inclusion' (*Workshop on the Digital Economy: Measurement, Regulation and Inclusion*, Santiago, Chile, 6 March 2019), http://mddb.apec.org/Documents/2019/EC/WKSP2/19_ec_wksp2_002.pdf.

(from the analogue world), as well as routers and servers.¹² Furthermore, by narrowing the definition of the digital economy, we are at risk of excluding aspects of the digital economy that are gaining importance, such as e-commerce platforms.

Challenges beyond defining the digital economy

There are various challenges related to the technicalities of measurement itself which further complicate the process of establishing a feasible measurement framework. These challenges include: limitations of the current national accounts framework; suitability of existing measures such as GDP; difficulties in separating digital and non-digital activities; overestimation and underestimation pitfalls; measuring services; and barriers on data sharing between organisations for various reasons including data privacy and security. This section reviews some of the challenges identified in the existing literature.

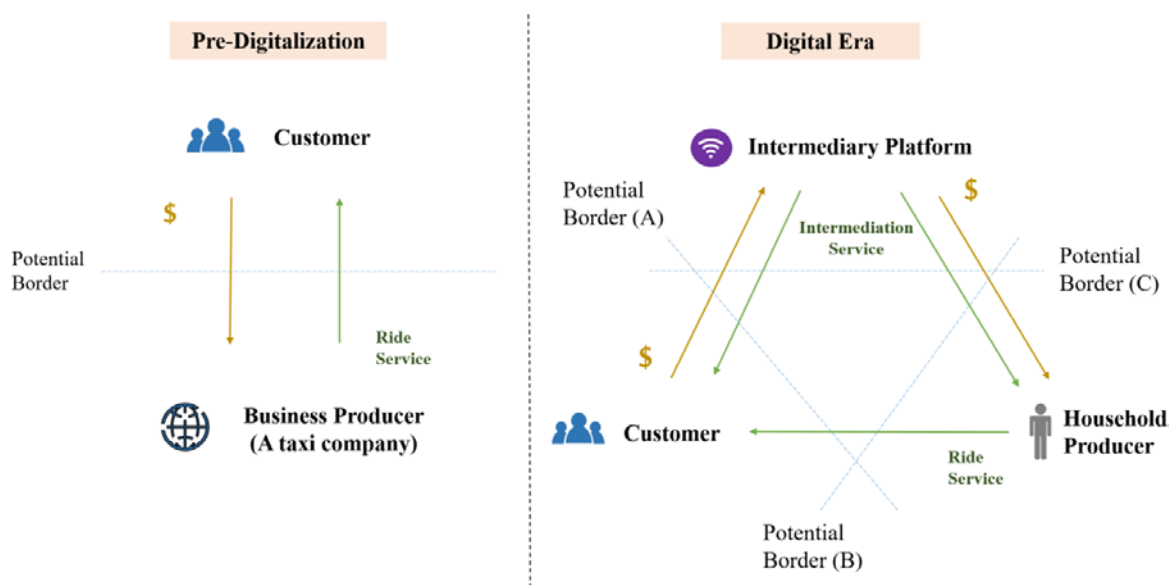
1. *Measuring digital and digitally-facilitated flows*

(In) congruency of the System of National Accounts (SNA) in the digital economy

The current framework used by economies was developed in the 1950s to 1960s and assigned clearly defined roles to all economic actors (i.e. producers, distributors, or consumers). It relies on customs and tax data, as well as high response rates to mandatory statistical surveys. The advent of the digital economy has affected some of these fundamental assumptions and methods.

Firstly, the digital transformation has changed the way economic actors interact and transact with one another (Figure A.2). For example, the entry of ride sharing providers such as Uber has disrupted the established relationship between taxi service providers and their customers, hence affecting statistical agencies' ability to accurately measure the contribution of the transport service sector to the economy through tax data and surveys of the taxi industry. Similarly, by turning consumers into service providers, Airbnb has made it challenging to measure the true contribution of the hospitality services sector to the economy. Measurement challenges are aggravated by the fact that many of these consumers-turned-service providers are operating beyond the current production frontier, are not registered businesses and/or do not report all taxes. While economies can mitigate this by employing surveys to collect additional information, it is generally more difficult to survey household producers (as compared to registered businesses), and the intermediary platforms themselves may be located in another economy, hence out of reach of the relevant statistical agencies.

¹² United Nations, ed., *International Standard Industrial Classification of All Economic Activities (ISIC)*, Rev. 4 (New York: United Nations, 2008), https://unstats.un.org/unsd/publication/seriesM/seriesm_4rev4e.pdf.

Figure A.2. An illustration of changing interaction and transaction between economic actors

Source: Adapted from Tuan Tran, 'Approach to Measuring the Digital Economy – Global Affairs Canada' (presented to the APEC Workshop on the Digital Economy: Measurement, Regulation and Inclusion, Santiago, Chile, 6 March 2019), http://mddb.apec.org/Documents/2019/EC/WKSP2/19_ec_wksp2_006.pdf.

Secondly, profit shifting, whereby related party firms move profit generated in one jurisdiction to a subsidiary in a lower-tax one, has been facilitated by digitalisation. This is particularly the case for certain transactions, where the common approach of using legal ownership to claim rights to related party profits could lead to distortions and asymmetries in national accounts to the extent that intercompany transactions are priced inappropriately. As a result, economic indicators based on those accounts may be inaccurate as well. For instance, despite relying on advertising revenue arising from and professional support services provided in one economy, much of the value associated with the revenue generated in that economy or activities performed there may actually end up on the balance sheets of the firm's subsidiary in another location (usually a low-tax location). This is because the firm providing the advertising services pays for intermediate services, which is provided by its subsidiary to generate the advertising services. For example, Facebook Australia recorded sales of USD 420 million in 2018, mostly from advertising, but attributed significantly lower net revenue and profit before taxes to its Australian related party since that related party made an intercompany payment of USD 320 million to overseas subsidiaries to purchase 'advertising inventory'. Consequently, the company paid an overall tax of USD 8.3 million, or about 2 percent of the recorded sales.¹³ Such profit shifting may not violate current international tax laws regarding taxable nexus and profit attribution, which uses the widely-adopted "arm's length standard," but efforts are being made to better attribute profits to the jurisdiction where "value" is created (e.g., the OECD/G20 Inclusive Framework on Base Erosion and Profit Shifting (BEPS) (see Box A.1) and the UN System of National Accounts (SNA-2008)).¹⁴ Many statistical agencies have yet to revise their methodologies to close this gap and reflect on these challenges.¹⁵

¹³ Rosie Perper, 'Facebook Pulled in over \$420 Million from Sales in Australia in 2018, but Paid Roughly 2% of That in Taxes', *Business Insider US*, 30 April 2019, <https://www.businessinsider.sg/facebook-paid-aud-12-million-tax-for-aud-598-million-sales-in-australia-2019-4/>.

¹⁴ Nadim Ahmad and Peter van de Ven, 'Measuring GDP in a Globalized World' (16 May 2018), <https://www.escoe.ac.uk/wp-content/uploads/2018/06/EM2018-Ahmad-and-van-de-Ven.pdf>.

¹⁵ Henry Lotin, 'Measurement of the Digital Economy - Integrative Trade and Economics' (6 March 2019), http://mddb.apec.org/Documents/2019/EC/WKSP2/19_ec_wksp2_005.pdf.

Box A.1. The tax challenges arising from digitalisation and the OECD/G20 BEPS Project

Digitalisation has driven considerable changes in the way business operates and led to the emergence of new business models. These changes have placed heavy pressure on the international tax system, including both direct and indirect taxes.

On direct tax, already in 2015, the Base Erosion and Profit Shifting (BEPS) Action 1 Report concluded that (1) “the whole economy was digitalising such that it would be difficult, if not impossible to ring-fence the digital economy” and (2) the digitalisation of the economy raises broader tax challenges for policy makers that go beyond BEPS, and relate primarily to the allocation of taxing rights among different jurisdictions.

With many economies starting to act unilaterally, there is an urgent need to reach an agreement on a consensus solution to the direct tax challenges. The G20 mandated the OECD/G20 Inclusive Framework on BEPS, which brings together 134 economies to deliver a consensus-based solution to address the direct tax challenges of the digitalisation of the economy by 2020.

In response to the mandate given by G20 Leaders, the Inclusive Framework agreed on 28 May 2019 the Programme of Work *to Develop a Consensus Solution to the Tax Challenges Arising from the Digitalisation of the Economy* (hereafter Programme of Work), which was endorsed by the G20 Finance Ministers and Leaders in June 2019. The Programme of Work provides a roadmap to develop a consensus-based long-term solution based on two pillars to reach a global agreement by the end of 2020.

The first pillar focuses on the allocation of taxing rights, and seeks to undertake a coherent and concurrent review of the profit allocation and nexus rules. The second pillar focuses on the remaining BEPS issues and seeks to develop rules that would provide jurisdictions with a right to “tax back” where other jurisdictions have not exercised their primary taxing rights or the payment is otherwise subject to effective taxation at a rate lower than a minimum rate.

The work on the tax challenges arising from the digitalisation of the economy is one action from the BEPS package adopted in 2015, which comprises 15 actions that equip governments with the domestic and international instruments needed to tackle tax avoidance. The monitoring and further development of standards in the BEPS Project is carried out by the members of the Inclusive Framework on BEPS.

On indirect tax, new guidelines and possible VAT collection mechanisms were discussed to address the challenges of collecting the VAT on online sales of services and intangibles by foreign vendors. The report concerning online sales suggested one approach to collecting VAT on goods imported by consumers is to have digital platforms collect the VAT to facilitate compliance and administration.

Adapted in full or part from:

- OECD, ‘BEPS’, <https://www.oecd.org/tax/beps/>
- OECD, ‘Addressing the Tax Challenges of the Digital Economy, Action 1 – 2015 Final Report’ (Paris: OECD, 2015), <https://doi.org/10.1787/9789264241046-en>.
- OECD, ‘OECD/G20 Inclusive Framework on BEPS: Programme of Work To Develop a Consensus Solution to the Tax Challenges Arising from the Digitalisation of the Economy’ (Paris: OECD, 2019), <https://www.oecd.org/tax/beps/programme-of-work-to-develop-a-consensus-solution-to-the-tax-challenges-arising-from-the-digitalisation-of-the-economy.pdf>
- OECD, ‘OECD/G20 Inclusive Framework on BEPS: Progress Report July 2018–May 2019’ (Paris: OECD, 2019) <https://www.oecd.org/tax/beps/inclusive-framework-on-beps-progress-report-july-2018-may-2019.htm>.

Indicators beyond GDP

Due to the limitations of the current SNA framework, standard measures such as GDP either do not capture or misallocate important aspects of the digital economy. For example, a report by Credit Suisse indicates that there are at least three categories of products and services not included in the GDP.¹⁶

Firstly, despite replacing the traditional high street stores, the services and products provided by digital intermediaries which includes online booking websites and online insurance or bank brokers based either locally or overseas have not been fully included.

Secondly, the digital economy has expanded the production boundary in ways that are not captured by traditional GDP measures. The rise of the sharing/gig economy has enabled individuals to borrow or lend a variety of assets from bicycles to houses, as opposed to leaving them idle. Individuals could also provide labour and services to others such as cleaning and repairs and earn income on a part-time or on-call basis. In addition, the reduced price paid by consumers has increased customer surplus and is yet to be reflected in the price indices used to calculate GDP.

The sharing economy connects individual sellers and customers through third-party websites or apps, while payment and transactions can be made offline in the form of cash, cheques or bank transactions. In some cases, these will no longer be recorded or traced by the original platforms, causing challenges in terms of accurate record-keeping and visibility by relevant tax authorities of income earned by sellers. Business or household questionnaires and surveys can be used to obtain information pertaining to these transactions but may not fully capture them. The results can be biased or unreliable when the sample is not representative, large enough or simply due to respondents' reluctance to give true answers.

Thirdly, 'free' digital products produced by households including blogs, videos, and open source software and computer services are not recorded within price indices and are therefore not reflected in GDP. Moreover, 'free' digital products/services offered by platforms and funded either by advertising (which may not be attributed to the correct economy) or through collection of user data is another category underrepresented within GDP measurements.¹⁷ For instance, while platforms such as Facebook, Rakuten Viber and Sina Weibo appear to be providing access for free, they generate profits through targeted advertisements based on the user information collected. This has led to considerable debate on how to measure the value of user information and attribute a value to 'free' digital products and services, in a way that captures their growing economic importance.

In summary, while critics have pointed before to the limitations of GDP, the advent of the digital economy brings additional measurement challenges.

Classification challenges, underestimation and overestimation

While some aspects of digital activities have been captured within current national accounts, identifying them separately may be difficult as they are often lumped together with other traditional (i.e. non-digital) activities.¹⁸ Efforts have been made by some economies (e.g., Australia; Canada; and the United States) to identify data sources for these activities in the current industrial accounts using supply-use tables, and will be elaborated further in the next section. However, such attempts remain in early stages, are limited in scope and could have been developed as a pure academic exercise.

Online platforms and social networks enable individuals to exchange and sell products to one another and create their own Facebook page, YouTube channel or Instagram account to market their products, which are either self-produced or sourced from somewhere else. Once there is a match, the buyer and

¹⁶ Credit Suisse Research Institute, 'The Future of GDP' (Zurich: Credit Suisse, May 2018), <https://www.credit-suisse.com/media/assets/private-banking/docs/mx/the-future-of-gdp-en.pdf>.

¹⁷ Reinsdorf and Quirós, 'Measuring the Digital Economy'.

¹⁸ Australian Bureau of Statistics, 'Measuring Digital Activities in the Australian Economy', updated 1 March 2019, <https://www.abs.gov.au/websitedbs/D3310114.nsf/home/ABS+Chief+Economist+-+Full+Paper+of+Measuring+Digital+Activities+in+the+Australian+Economy>.

seller may exchange private messages and agree on a payment method (e.g., PayPal, bank transfer). Such online ‘stores’ do not typically have a physical presence and may not be treated as business entities. As these products are shipped as personal parcels, they are often not taxed or recorded. For statisticians, while such ‘exchange’ or ‘trade’ between individuals can be facilitated by digital platforms, tracking and measuring such transactions would be challenging and resource intensive. In this case, limitations in the SNA used to calculate GDP can lead to an underestimation of the size and potential of the digital economy.

Alternatives to estimating the size of the digital economy includes monitoring cross-border data flows, but these may lead to issues such as overestimation, which have affected traditional metrics as well. As pointed out by Lund and Manyika, data may be routed across many borders to connect two endpoints, and exchanges involving the streaming of video use more bandwidth than other simpler forms/cross-border data flows. Furthermore data-intensive flows such as Youtube videos cannot easily be mapped to value due to the challenges mentioned above. As a result, neither bandwidth nor total data flows are an accurate proxy for the value of the digital economy.¹⁹

Measuring services

The international community has long been plagued by statistical problems associated with services. For example, variations in compilation methods and different thresholds used by surveys have caused the estimated value of services trade data to vary significantly between economies.²⁰ While digital technologies have allowed services to be traded freely, easily and on a broader scale, they have aggravated the measurement issue, for several reasons.

First, traditional services such as education services that need to be conducted in person in the past, can now be provided digitally in many cases and sometimes for free. **Second**, the digital economy has led to further blurring of geographical boundaries, even beyond the fragmentation of production by global value chains. Unlike traditional trade, digital services may consist only of the transfer of data. The constant data flows between different activities (e.g., R&D, sales and advertising) with various actors across numerous locations make it challenging to trace such flows and attribute the value of a particular service to a specific geographical location.²¹ This makes it more difficult for statisticians to record the services and include them within their accounts.

Third, as pointed out by a 2018 IMF report on measuring the digital economy, digitally delivered services can be under-reported in SNA accounts that do not capture transactions on platforms, especially on the import side. Inconsistencies and discrepancies are sometimes found in the services statistics of two trading partners due to differing statistical and data collection methods. Luxembourg’s service exports to European Union (EU) economies, for example, are substantially higher than the imports recorded by its trading partners. This is due to the fact that some digitally delivered services (e.g., digital music provided by Spotify) are captured in Luxembourg’s export data, but not in the data of the importing economies.²²

A **fourth** challenge arises from the increasing vagueness and difficulty in distinguishing the value of products and the accompanying services.²³ For instance, the cost of regular system and software updates that keep mobile phones useful may have been included by producers when pricing the product instead

¹⁹ Susan Lund and James Manyika, ‘How Digital Trade Is Transforming Globalisation’ (International Centre for Trade and Sustainable Development, and World Economic Forum, September 2015), <http://e15initiative.org/wp-content/uploads/2015/09/E15-Digital-Lund-and-Manyika.pdf>.

²⁰ Eurostat, ‘International Trade in Services Statistics – Background’, 28 March 2019, https://ec.europa.eu/eurostat/statistics-explained/index.php/International_Trade_in_Services_statistics_-_background#Asymmetries_in_international_trade_in_services_statistics.

²¹ Credit Suisse Research Institute, ‘The Future of GDP’.

²² Reinsdorf and Quirós, ‘Measuring the Digital Economy’.

²³ Tuan Tran, ‘Approach to Measuring the Digital Economy – Global Affairs Canada’ (presented to the *APEC Workshop on the Digital Economy: Measurement, Regulation and Inclusion*, Santiago, Chile, 6 March 2019), http://mddb.apec.org/Documents/2019/EC/WKSP2/19_ec_wksp2_006.pdf.

of as a separate line item. **Finally**, little progress has been made across the globe on measuring micro-services (e.g., door to door cleaning and repairing services) or free digital services (e.g., online knowledge sharing, medical consultation, and open source software and computer services) produced by households. In this regard, there may be a need to update household and labour force surveys and improve data collection from tax systems.

Data sharing and development state of economies

One of the ironies of the digital age is that data and statistics that could provide policymakers a better overview of the digital economy are available but not shared. According to a Domo report, more than 2.5 quintillion bytes of data were created every single day in 2018. By 2020, the report estimates that each individual will generate 1.7MB of data every second.²⁴ Theoretically, every order and transaction made online is recorded somewhere and it is possible to analyse such data for statistical purposes. This is particularly relevant for digital platforms whose main business is to collect, analyse and create value from the data. However, in practice, data collected and stored by different entities are fragmented and not shared. While individuals and private companies, especially digital platforms have significant amount of data, they are usually reluctant to share it with governments, arguing that it is proprietary and that sharing it would affect their competitiveness and breach their privacy commitments. To further complicate matters, multinational companies (MNCs) often hold data in various jurisdictions whose differing data privacy laws and regulations would impact their data policies. This limits the ability of statistical agencies to accurately measure the size of certain digital economic activities.

A universal measurement framework for the digital economy also needs to take into consideration the development gaps between economies, in order to ensure the feasibility of data collection and comparability of statistics across economies. Developing economies may possess inadequate resources or may require capacity building to bring their statistical collection up to international standards and to ensure comparability and coordination with other economies.²⁵ Lack of sustainable funding, inadequate public ICT infrastructure and poor digital literacy among statistical staff are some of the barriers to a comprehensive and accurate statistical system for the digital economy. Some economies are struggling to maintain their existing SNA database, let alone put extra effort into creating a new one. According to the UN Statistics Division, in some economies, entire statistics programmes are supported by only two or three people.²⁶

2. *Measuring digital transformation*

Measuring digital flows is important. Equally important is measuring digital transformation because it allows us to better understand how digitalisation is changing the economy and society as a whole and to adjust policies as required. Economies and various organisations have been collecting and analysing indicators to monitor digital transformation and compare economies over time. With regard to internet access, organisations such as the International Telecommunication Union (ITU) have developed indicators such as the percentage of individuals using the internet, fixed broadband subscriptions per 100 inhabitants, the proportion of households with a computer and the percentage of households with internet connections. In terms of the ability to use digital technologies and tools, the United Nations Educational, Scientific and Cultural Organization (UNESCO) collects indicators such as enrolment in tertiary education and percentage of tertiary graduates in the natural sciences, engineering and ICT. The OECD conducts surveys under various programmes including the Programme for International Student Assessment (PISA), the Teaching and Learning International Survey (TALIS) and the Programme for the International Assessment of Adult Competencies (PIAAC) to provide international comparable data

²⁴ Domo, 'Data Never Sleeps 6.0', 2018, <https://www.domo.com/solution/data-never-sleeps-6>.

²⁵ World Bank, 'Building Statistical Capacity To Monitor Development Progress' (Washington, DC: World Bank, 2006), <http://documents.worldbank.org/curated/en/795451468314360987/Building-statistical-capacity-to-monitor-development-progress>.

²⁶ Lisa Cornish, 'At UN World Data Forum, a Focus on Data Capacity', Devex, 22 October 2018, <https://www.devex.com/news/sponsored/at-un-world-data-forum-a-focus-on-data-capacity-93717>.

on a variety of indicators, many of which describe the relationship between digital technology and education and skills.²⁷

While they are useful and informative, existing indicators are not without gaps and challenges. **First**, these indicators may not cover all economies. In some cases, the data may be patchy (available only for certain years), and the timeliness of the data (how recently it is produced) could also be a concern. For example, data on enrolment in tertiary education from UNESCO is only available as of 2017, and only covers some APEC economies. Moreover, indicators provided by economies may be derived from varying data sources as well as through the use of different collection methodologies and approaches (e.g., household surveys versus business surveys), which means that the data may not be comparable.

Second, some existing indicators need to be fine-tuned to ensure their continued relevance in the digital era. For example, indicators on access which includes the percentage of individuals using the internet, would be more informative if supplemented with additional information on how individuals use the internet (e.g., online education, online sales/purchases, cloud storage, content creation, social network, etc.), information which may not be collected by all economies. Likewise, indicators such as the use of robots as well as other technologies and tools including AI, 3D printing and blockchain should not only indicate whether firms use them or not, but rather be complemented with information on how utilisation has impacted firms in areas such as costs and contribution to profit and value creation. Such indicators would give a better picture of the extent to which sectors and economies are being transformed.

Similarly, indicators on skills, abilities and competencies to thrive in the digital economy should go beyond measures such as enrolment in tertiary education to include information on whether individuals have the specific technical and cognitive skills. This is particularly so considering that getting a post-secondary degree no longer guarantees one a job. In fact, many question whether the current education system adequately prepares an individual for the future of work, and asks if it requires a major overhaul.²⁸ In terms of job creation, new business models introduced by platforms focusing on the gig economy (i.e., ride-sharing and food delivery services) have led to a significant increase in the number of independent contractors (as opposed to employees). With the continuous transformation of the economy and the advent of newer business models, different types of independent and freelance work are likely to become common while full-time employment becomes scarcer. Yet, current definitions and indicators still group these jobs collectively as ‘alternate work arrangements’, implicitly treating them as a homogeneous and insignificant category. If participation in the sharing/gig economy becomes the norm for a significant proportion of the population, then commensurate indicators to better monitor them would be needed.

Furthermore, it should be noted that existing indicators do not always provide breakdowns by criteria such as regional (e.g., rural (including remote) and urban), industry (e.g., manufacturing and services), gender and age groups. The push for inclusivity at a time of widening disparity calls for indicators to be disaggregated based on these criteria so that policymakers can make more focused, evidence-based interventions.

Finally, even as the existing indicators can be improved upon, it should be acknowledged that there are aspects of the digital economy that cannot be captured by existing indicators and therefore, have to be complemented by new indicators. While digital technologies and tools have made data collection more efficient, the use of this data including administrative records have ironically been limited, at least by official statistical agencies.

²⁷ OECD, ‘Computers, Education & Skills’, Education GPS, accessed 19 September 2019, <https://gpseducation.oecd.org>.

²⁸ For examples of changes in some economies, see World Bank, ed., *World Development Report 2019: The Changing Nature of Work* (Washington, DC: World Bank, 2019).

3. *Measuring how laws and regulations affect various aspects of the digital economy*

As discussed earlier, the advent of the digital economy has brought with it new business models. In turn, they have changed how businesses including trade, are conducted and what products are being traded. In this environment, policies and regulations with implications for the digital economy can generally be categorised into two main groups. The first group comprises existing or older measures that arguably were not robust enough to tackle the new challenges posed by the digital economy, and have since become problematic as the wider economy is transformed by new technologies and business models. The second group is made up of newer measures enacted in response to the ongoing transformation for various reasons including legitimate public policy objectives such as ensuring better data privacy, protection and security; aiding law-enforcement agencies and addressing other domestic security concerns. This group also includes policies that seek to capitalise on potential digital economy benefits in terms of employment, innovation/technology know-how, etc.

To ensure that economies are able to reap the benefits of the digital economy while addressing its challenges, it is important that the policies and regulations and their corresponding implications be analysed. This is particularly so considering that the laws and regulations have to balance different objectives. For example, while improving data privacy is a legitimate public policy objective, adherence to privacy laws have been used by firms to justify restricting access to data even when there are valid reasons to make the data available, such as the need to better measure the digital economy. To perform the needed analyses, economies and organisations would have to have comprehensive policy databases that are updated and reviewed at regular intervals.

Ongoing work on measurement

1. *Measuring digital and digitally-facilitated flows*

Tackling the measurement issues requires a more consistent and transparent method of measurement and data collection. Coordination between different organisations and economies is needed to improve data quality and comparability. Work is underway by governments and international organisations to develop widely accepted measurement criteria capturing different aspects of the digital economy. In 2017, the OECD created an advisory group on measuring GDP in a digitalised economy in order to develop new classifications and accounting tools. The group proposed a conceptual framework for the digital economy based on extensive literature research. At the same time, a survey was conducted to obtain economies' perspectives on issues such as the definitions of various terms, data availability and product classifications. The survey responses revealed areas of agreement and disagreement²⁹ and the advisory group continues to undertake activities including workshops.³⁰

Based on the OECD's work, several APEC economies have attempted to estimate the size and contribution of their digital economies. Their efforts have benefited from collaboration and the ability to learn from one another's efforts. The US BEA published a study in 2018 to estimate the size and contribution of digital activities currently embedded in the existing accounts. This study developed a conceptual definition of the digital economy, with reference to the work done by the OECD. The bureau further updated the estimate in April 2019 to extend the coverage to year 2017.³¹

²⁹ Ribarsky, 'Summary of Responses of the Advisory Group: Survey on Digital Economy Typology'.

³⁰ For examples, see John Mitchell, 'A Proposed Framework for Digital Supply-Use Tables' (SDD/CSSP/WPNA(2018), Paris: OECD, 2018),

[http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=SDD/CSSP/WPNA\(2018\)3&docLanguage=En](http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=SDD/CSSP/WPNA(2018)3&docLanguage=En); and Peter van de Ven, Jorrit Zwijnenburg and John Mitchell, 'Informal Advisory Group on Measuring GDP in the Digital Economy' (SDD/CSSP/WPNA/A(2019)1, Paris: OECD, 2019),

[http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=SDD/CSSP/WPNA/A\(2019\)1&docLanguage=En](http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=SDD/CSSP/WPNA/A(2019)1&docLanguage=En).

³¹ US Bureau of Economic Analysis, 'Measuring the Digital Economy: An Update Incorporating Data from the 2018 Comprehensive Update of the Industry Economic Accounts'.

Canada and Australia published their first estimates of the digital economy in early 2019, using the OECD framework³² and BEA approach as starting points. Digital products were selected from the national supply-use tables, and their employment statistics and value added to GDP were calculated.³³ Canada then built on the work by the US BEA by identifying ‘full’ and ‘partial’ digital products. All of the output of the ‘full’ digital products is included in the estimates, while only part of the output for the ‘partial’ ones is included.³⁴ This approach is a good first step that will increase the visibility of key digital economy sectors.

However, one of the limitations of the approach of all three economies is the reliance on traditional data sources and the existing industrial classification framework including the current SNA, which as discussed previously, come with their own limitations. Alternate data sources, such as crowdsourcing, web scraping and machine learning have been proposed for further study.³⁵ However, these can at best be a partial substitute for government data sources (census and tax-based data).

New avenues for data collection are being explored to measure the ‘invisible’ services or products in the digital economy. For example, the UK Office for National Statistics is working on adding new questions into the economy’s Labour Force Survey (LFS) to measure activities pertaining to the sharing economy. The intent is to investigate whether digital platforms have been used by respondents to find work and whether it is the main source of income. The questions have been tested in the annual pilot of the LFS, and are in the process of being further improved.³⁶

On sharing data, many economies such as Japan; Korea; New Zealand; Chinese Taipei; and the EU require foreign enterprises that do not have a local physical presence but sell digital goods and services in the economy to report and pay value-added tax (VAT).³⁷ Members of the OECD Forum on Tax Administration (FTA) are working collaboratively to develop a model framework for standardised reporting by platforms to enable effective collection and exchange of identification and transaction information for sellers between jurisdictions in appropriate circumstances.³⁸ This will likely improve an economy’s ability to capture aspects of digital activities and better estimate the size of the digital economy.

2. Measuring digital transformation

In response to the demand for more systematic and organised indicators to track the digital transformation, the G20 during Argentina’s 2018 presidency produced a toolkit consisting of 35 indicators that cover four dimensions of the digital economy: infrastructure; innovation and technology adoption; jobs and growth; and society (see Box A.2).³⁹

³² Nadim Ahmad and Jennifer Ribarsky, ‘Towards a Framework for Measuring the Digital Economy’ (paper prepared for the 16th Conference of IAOS/OECD Headquarters, Paris, France, 19–21 September 2018), http://www.oecd.org/iaos2018/programme/IAOS-OECD2018_Ahmad-Ribarsky.pdf.

³³ Australian Bureau of Statistics, ‘Measuring Digital Activities in the Australian Economy’.

³⁴ Statistics Canada, ‘Measuring Digital Economic Activities in Canada: Initial Estimates’, updated 9 May 2019, <https://www150.statcan.gc.ca/n1/pub/13-605-x/2019001/article/00002-eng.htm>.

³⁵ Statistics Canada; Australian Bureau of Statistics, ‘Measuring Digital Activities in the Australian Economy’; US Bureau of Economic Analysis, ‘Measuring the Digital Economy: An Update Incorporating Data from the 2018 Comprehensive Update of the Industry Economic Accounts’.

³⁶ UK Office for National Statistics, ‘The Feasibility of Measuring the Sharing Economy: November 2017 Progress Update’, 9 November 2017, <https://www.ons.gov.uk/releases/thefeasibilityofmeasuringthesharingeconomynovember2017progressupdate>.

³⁷ EY, ‘Taiwan Issues Ruling on New Tax Guidelines on Cross-Border e-Commerce Transactions’, 4 May 2017, <https://www.ey.com/gl/en/services/tax/international-tax/alert--taiwan-issues-ruling-on-new-tax-guidelines-on-cross-border-e-commerce-transactions>.

³⁸ OECD, *The Sharing and Gig Economy: Effective Taxation of Platform Sellers: Forum on Tax Administration* (Paris: OECD, 2019), <https://doi.org/10.1787/574b61f8-en>.

³⁹ G20, ‘Toolkit for Measuring the Digital Economy’ (G20, November 2018), <http://www.oecd.org/g20/summits/buenos-aires/G20-Toolkit-for-measuring-digital-economy.pdf>.

New indicators that are more reflective of the digital transformation are also currently being explored. For instance, the G20 toolkit includes an indicator to measure machine-to-machine (M2M) communication, an important underlying component of the IoT. There are also plans to start developing new indicators. It is important to monitor the size and impact of digital platforms given that they often provide digital economy ‘infrastructure’ that individuals, firms and even governments depend on. In developing these new indicators, economies and organizations have to be open to such alternatives and to diverse sources of data. They should also promote the use of interoperable data formats and tools, as these could facilitate greater data access and sharing.

Box A.2. The G20 Toolkit for Measuring the Digital Economy

The G20 Toolkit for Measuring the Digital Economy brings together various methodological approaches and indicators to better monitor the digital transformation. It also highlights the challenges and gaps that economies and international organisations (IOs) may consider for further work.

As the objective is to compile standardised and comparable indicators across the G20 economies, the toolkit focuses on existing indicators and methodologies. For the most part, the toolkit relies on indicators that have been developed by IOs with expertise and active workplans related to the digital economy such as the International Labour Organization (ILO), the International Monetary Fund (IMF), the International Telecommunication Union (ITU), the Organisation for Economic Co-operation and Development (OECD), the United Nations Conference on Trade and Development (UNCTAD) and the World Bank. They are categorised into four main themes as shown below:

Theme	Description	Examples of indicators
Infrastructure	Contains indicators on the development of physical, service and security infrastructures underlying the digital economy	<ul style="list-style-type: none"> Fixed broadband subscriptions per 100 inhabitants Mobile broadband prices Percentage of households with internet connections
Empowering society	Contains indicators which captures the evolving role of the digital economy in daily lives	<ul style="list-style-type: none"> Percentage of internet users age 16-74 year olds Registered mobile money accounts per 1,000 adults Percentage of individuals with specific types of information and communications technology (ICT) skills among internet users
Innovation and technology	Contains indicators that look at innovation in digital technologies, the role of ICTs as an engine for innovation and their adoption by businesses, among others	<ul style="list-style-type: none"> Number of IP5 patent families in artificial intelligence (AI) Industrial robot stock over manufacturing value added Diffusion of selected ICT tools and activities among enterprises
Jobs and growth	Contains indicators that evaluate how digital technologies are contributing to economic growth and employment creation	<ul style="list-style-type: none"> Employment of different categories of ICT specialists as a percentage of total employment Percentage of different sized enterprises engaged in sales via e-commerce ICT contribution to labour productivity growth

Source: G20, ‘Toolkit for Measuring the Digital Economy’ (G20, November 2018), <http://www.oecd.org/g20/summits/buenos-aires/G20-Toolkit-for-measuring-digital-economy.pdf>.

The toolkit identifies two types of gaps and challenges. The first, methodological gaps, pertain to what existing indicators measure and the extent they capture the digital economy. The second, availability gaps, pertain to the lack of capacity and resources by economies to implement international standards to guide their statistical collection even if they exist. The toolkit also proposes actions to address these gaps and challenges.

To improve the current data collection and survey methodologies, OECD has revised their model surveys on the adoption and use of ICT by households and businesses. The revisions extended the scope of the surveys and included new indicators and themes such as protection of children in the online world, usage of ICTs in school, businesses' ICT expenditure and acquisition, and E-Government.⁴⁰

3. *Measuring how laws and regulations affect various aspects of the digital economy*

Tools measuring restrictions that could affect the digital economy are being developed by organisations such as the OECD and World Bank. The OECD Services Trade Restrictiveness Indicators (STRI) allow policymakers to see how measures in sectors that play important roles in the digital economy (e.g., telecommunications and logistics) could restrict trade. With the accompanying policy simulator, policymakers are able to observe how proposed regulatory changes might improve the current situation or make it worse.⁴¹ The World Bank Services Trade Restrictiveness Database has the same purpose.⁴² However, it employs with a different methodology and does not include a policy simulator. The OECD Trade Facilitation Indicators (TFI) cover the full spectrum of border procedures, allowing to identify how specific trade facilitation policies may affect at-the-border costs, including for digitally enabled trade in goods.⁴³ The OECD has also developed the Digital Services Trade Restrictiveness Indicator (Digital STRI). It identifies, catalogues and quantifies cross-cutting barriers that affect the trade in digitally enabled services, and also features an online policy simulator. It covers 46 economies, including 11 APEC economies.⁴⁴ Last but not least, organisations such as the European Centre for International Political Economy (ECIPE) have created databases that compile the approaches to cross-border data flows utilised by economies.⁴⁵

⁴⁰ OECD, 'The OECD Model Survey on ICT Access and Usage by Households and Individuals – 2nd Revision' (Paris: OECD, 2015), <https://www.oecd.org/sti/ieconomy/ICT-Model-Survey-Access-Usage-Households-Individuals.pdf>; OECD, 'The OECD Model Survey on ICT Usage by Businesses – 2nd Revision' (Paris: OECD, 2015), <https://www.oecd.org/sti/ieconomy/ICT-Model-Survey-Usage-Businesses.pdf>

⁴¹ OECD, 'Services Trade', accessed 19 September 2019, <http://www.oecd.org/trade/topics/services-trade/>.

⁴² World Bank, 'Services Trade Restrictions Database', updated 26 October 2017, <https://datacatalog.worldbank.org/dataset/services-trade-restrictions-database>.

⁴³ OECD, 'Trade Facilitation', accessed 19 September 2019, <http://www.oecd.org/trade/topics/trade-facilitation/>.

⁴⁴ OECD, 'Digital Services Trade Restrictiveness Index', accessed 19 September 2019, https://stats.oecd.org/Index.aspx?DataSetCode=STRI_DIGITAL

⁴⁵ European Centre for International Political Economy (ECIPE), 'Digital Trade Estimates Database', accessed 19 September 2019, <https://ecipe.org/dte/database/>.