Chapter 22: Digitalisation

BPM7 Chapter 16 – Digitalisation

(new chapter)

Note: This draft chapter has been prepared jointly to cover the full range of topics to be included in the SNA and BPM chapters on digitalization. Only those issues that are relevant for external sector statistics will be included in the BPM; likewise, only those issues that are relevant to national accounts will be included in the SNA.

A. Introduction

22.1 Falling costs and rising capabilities to process, transmit, and store digitized data have resulted in the extensive integration of digital technology into goods and services and the activities of production and consumption. This transformation of economic activity and daily life through the pervasive application of digital technology is referred to as digitalization. Digitalization has been enabled by ~~many types of~~ information and communications technology (ICT) goods and services, including the internet, semiconductor chips, computing and electronic communication equipment, software, ~~the internet,~~ and wireless digital telecommunication services.

22.2 A wide variety of digital products and activities have appeared as part of digitalization, and digital assets, (defined as assets that exist only in digital form ~~(~~such as crypto assets~~),~~ and data and software~~)~~ have assumed important roles as stores of wealth or inputs in production. The profound impact of digitalization on production, consumption, transacting, investment, prices, finance, and other aspects of the economy, as well as its impact on international trade in goods and services and other cross-border transactions, calls for enhanced visibility of digital activities, products, and transactions in the macroeconomic accounts. Guidelines are therefore needed on measuring the activities, products, and assets associated with digitalization in the conceptual framework of the SNA/BPM and on enhancing the visibility of digital activity and products in the macroeconomic accounts.

22.3 Measurement issues associated with digitalization, or that touch on digitalization, are also discussed in other chapters of the SNA/BPM and in other manuals. To increase the visibility of digitalization, chapter 11 of the Balance of Payments and International Investment Position Manual, recommends showing computer and information services as a first-level services category in the balance of payments current account. The capital account chapter in the SNA and the chapters on goods and services account in the BPM discuss the main types of non-financial assets that have enabled or resulted from digitalization, which include ICT equipment, software, data and databases, crypto assets without a corresponding liability, and digital elements of research and development. The financial accounts chapter of the SNA and the chapter on classification of financial assets and liabilities in BPM discuss classification of crypto assets with a corresponding liability and electronic money (e-money). The SNA chapter on measuring prices, volumes and productivity discusses measurement challenges that affect products associated with digitalization, such as adjusting price comparisons for quality change. Finally, the 2023 edition of the *Handbook on Measuring Digital Trade* discusses digital intermediation platforms and other aspects of trade affected by digitalization and the *OECD Handbook on Compiling Digital Supply and Use Tables* discusses tools to increase the visibility of digitalization in macroeconomic accounts.

22.4 To provide a consolidated view of measuring and reporting on key aspects of digitalization, and to cover additional aspects of digitalization, this chapter considers the main conceptual and measurement issues presented by the products, activities, and assets, including related cross-border transactions, that have emerged as part of digitalization and recommends tools for increasing the visibility of digitalization in national accounts/external sector statistics. The rest of this chapter is organized as follows. Section B introduces digital transactions, ~~activities~~industries and products. Section C ~~considers~~ discusses ~~two types of nonfinancial~~ digital ~~online~~ platforms, including non-financial digital intermediation platforms ~~and free online platforms,~~ along with free online platforms and other free products associated with digitalization. Section D discusses digitalization and the financial system, with subsections on new financial services and means of payment enabled by digitalization, financial digital ~~intermediation~~ platforms, and fungible digital assets,

including crypto assets. These sections (B, C, and D) also highlight the issues relevant for external sector statistics. Section E provides an overview of the issues and challenges presented by digital products for the measurement of prices and volumes and their solutions. Section F concludes the chapter with a section on analytical tools to increase the visibility of digitalization, including a thematic account based on the digital supply and use tables (SUTs), and an extended account showing an alternative treatment of the consumption of free services of digital platforms.

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B. Digital Transactions, ~~and~~ Industries and Products

22.5 An analysis of digital transactions is a key part of understanding the current state and evolution of digitalization, as digital transactions enable many of the activities and products associated with the digital transformation. Digital transactions include both digitally ordered and digitally delivered transactions and can encompass both goods and services. Digitally ordered transactions are transactions ordered over a computer network by methods specifically designed for receiving or placing orders. Digitally delivered transactions are transactions that are delivered remotely over computer networks.

22.6 E-commerce transactions are characterized by digital ordering. An e-commerce transaction is the sale or purchase of a good or service conducted over a computer network by methods specifically designed for the purpose of receiving or placing orders. E-commerce transactions can be ordered from a retail or wholesale trader, directly ordered from the producer or supplier of the good or service, or ordered via a digital intermediation platform (DIP). E-commerce margin services are supplied by retail and wholesale traders that receive orders digitally.

22.7 Digital industries ~~(or activities)~~ include the producers of the goods and services that enable digitalization. For example, digital transactions are made possible by digital networks and complementary ICT products. Digital industries also include the industries enabled by digital networks. One such industry consists of e-tailers, which are retail and wholesale traders that receive most orders digitally. Other digital industries discussed below are DIPs, platforms based on data collection and advertising, and financial service providers that predominantly operate digitally. In addition, the analysis of digital industries discussed as part of the digital SUTs includes a row for producers dependent on DIPs and a row for other producers operating only digitally. ~~Services supplied over a computer network are a defining feature of the digital economy. These digital economy services include wholesale and retail e-commerce distribution services,~~

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Digital Products

22.8 This section defines the digital products that could be included in an analysis of the supply and use of digital products or of international trade in digital products. Some products that have emerged as part of digitalization raise measurement questions. This section also includes subsections on the measurement of some specific digital products.

22.9 Digital products either enable digitalization or are enabled by digital technology and infrastructure. The products enabling digitalization include ICT goods (both ICT equipment and components), software, data and databases, and telecommunication and network communication services. ~~ICT components may be embedded in non-digital goods (such as semiconductor chips in motor vehicles).~~ The products enabled by digitalization include services delivered over a computer network, such as cloud computing (which is also an enabler of many digital services), digital intermediation and other services of online platforms, audio and video streaming, online conferences, online learning, and digital financial and payment services.

22.10 Digital products can be divided into ICT goods and digital services, with digital knowledge-capturing products such as computer programs, data and databases included in digital services unless sold on physical media such as a disk. The ICT goods are the goods included in the ICT products of the alternative structure for products of the information economy in the Central Product Classification (CPC) version 2.1. Digital services include the ICT products that are services – ICT services, digitally delivered content and media products such as online video games ~~and online content~~, and services of validating transactions in digital assets. Knowledge-capturing products are grouped with services even though they have some of the characteristics of a good. ~~priced and free services of onl ine platforms, audio and video streaming, and digital financial and payment services~~

~~22.5 . ICT equipment, software, and data and databases along with ICT consumer durable goods, and mobile and fixed line digital communication services ICT components embedded in non-ICT equipment (such as semiconductor chips in motor vehicles)~~

~~22.6~~22.11 Digitalization has ~~also~~ resulted in, and been accelerated by, the emergence of cloud computing as a new way of accessing ~~information technology (~~ICT~~)~~ resources. It has also resulted in new types of assets. The conceptual and measurement issues raised by cloud computing, data assets, artificial intelligence (AI) systems, and non-fungible tokens as a type of digital asset are discussed in this subsection. Online platforms are discussed in subsection ~~C,~~D and digital financial services and fungible digital assets are discussed in subsection ~~D~~E.

1. Cloud computing

~~22.7~~22.12 Cloud computing technology has enabled a shift in the location where most computing occurs from the user's~~'~~ premises to remotely located data centers accessed over a network, sometimes referred to as "the cloud." Furthermore, the growing use of cloud computing services has caused large scale substitution of purchased ~~IT~~ICT services for ownership of ~~hardware~~computing and communication equipment and software assets. Cloud computing services are used in the production or delivery of m~~M~~any of the digital services delivered over the internet ~~are produced with inputs of cloud computing services~~. Cloud computing services are primarily used as an input into the production of other goods and services (i.e., for intermediate consumption).

~~22.8~~22.13 Cloud computing services consist of computing, data storage, software, and related ICT services accessed remotely over a network, supplied on demand and with measured resource usage. Measured resource usage allows pay-per-use charging based on actual resources consumed, although ~~.~~ ~~(C~~charges ~~for some services, such as data storage, may instead~~ are sometimes ~~be~~ based on predetermined limits on the IT resources accessed (e.g., data storage).~~)~~ Measured resource usage also helps allocate resources efficiently because cloud computing technology takes advantage of resource pooling. Another characteristic of cloud computing technology is rapid elasticity, which means that users with fluctuating or fast-changing computing needs can scale their consumption up or down as circumstances warrant.

~~22.9~~22.14 The main cloud computing products can be divided into three broad categories: i) infrastructure-as-a-service (IaaS), which gives the user on-demand access to hardware such as a virtual server; ii) platform-as-a-service (PaaS), which also includes access to a software platform; and iii) software-as-a-service (SaaS), which includes access to the application software. Users of IaaS or PaaS provide their own software license, or software original. Function-as-a-service (FaaS) is a simplified type of PaaS that allows application functionalities to be executed ~~run~~ in response to events. In addition, business-process-as-a-service (BPaaS) enables organizations to automate business processes using cloud computing software and platforms (i.e., SaaS and PaaS).

~~22.10~~22.15 Cloud computing is part of a broader shift to remote computing that also includes the growth of colocation and hosting services. Remote datacenters can offer advantages such as physical infrastructure that supports large-scale computing, high network bandwidth and optimized connectivity, low cost, and security. To benefit from such advantages, IT users may lease space for their equipment in a colocation datacenter, or they may lease servers and other ICT equipment from a supplier of managed or unmanaged hosting services. IT users often consume a combination of the three types of remote computing services – for example, their colocated or hosted equipment may connect with a supplier of cloud computing services.

~~22.11~~22.16 Cloud computing users with a long-term contract for dedicated access to a server in a cloud computing datacenter are considered to be economic owners of the server if the operating risk is borne by the user, making the contract a financial lease. Also, rather than paying per-use licensing fees to access a software product supplied by the cloud computing enterprise, cloud computing users may hold long-term license for a software product that they access in the cloud. If the term of the software license is more than a year, the license conceptually represents a software asset of the user, and one-year software licenses that automatically renew are also treated on the same lines, for practical reasons. Software subscriptions from software publishers that come with a long-term license are software assets, not intermediate consumption of software services (which is the case with licenses of less than one year). This follows the treatment of software licenses

outlined in paragraph 10.100, 2008 SNA (and its update in 2025 SNA chapter 11). ~~The treatment of cross-border transactions in such licenses (more than one year/less than one year) is under discussion and will be included in Chapter 11, Services Account, *BPM7*.~~

~~22.12~~22.17 The fixed capital formation of cloud computing enterprises may include own-account production of software and equipment or equipment designs. For example, a large cloud computing enterprise may design equipment that meets its needs and outsource the physical production to a contract manufacturer. This enterprise's production of original equipment designs is~~may be~~ measured by its cost and may be categorized as either own-account investment in equipment or ~~part of~~ own-account R&D capital formation.

~~22.13~~ Data center construction is also part of the fixed capital formation associated with cloud computing. Real estate enterprises that specialize in the construction and operation of data center buildings often lease data center buildings to cloud computing enterprises. If the cloud computing enterprise bears the operating risks, the lease should be treated as a financial lease.

~~22.14~~22.18 The shift from purchasing software and hardware as ICT fixed assets to consuming cloud computing services presents challenges for the analysis of the contribution of ICT fixed capital formation to economic growth and total factor productivity (TFP) growth. To provide the detailed data on consumption of cloud computing and hosting services needed to understand the changes in how ICT resources are accessed and the general role of ICT in production may require adding product detail on cloud computing and related services to existing classifications. This could be done as part of the digital supply and use table (SUT) or the digital economy thematic account discussed in Section F.

~~22.15~~22.19 Cloud computing and other remote computing services are often supplied across borders, and important suppliers of these services are multinational enterprises with domestic and foreign computing establishments connected by cross-border networks. The consumption of these services takes place in the location of the production process into which they are an input. For example, if a business in country A purchases computing services from a cloud computing establishment in country B, the computing services will be an export of country B and an import of country A. In balance of payments, these services are recorded as part of the standard component computer and information services (refer to Chapter 11, Services Account, BPM7~~)~~ for further details). The resource pooling aspect of cloud computing technology, which means that workloads can shift between servers or even establishments, can make it hard to know where the physical production of a computing service occurred. However, the flows of spending on ~~exported and imported~~ cloud computing should be ~~possible~~ more feasible to track. Also, ensuring that the estimates of exports and imports of cloud computing services are consistent with the value of net exports implied by the difference between the economy's ~~-~~production and consumption of cloud computing services ~~-~~may improve th~~os~~eir accuracy. ~~estimates~~ For an economy that is just an importer of cloud computing services (and not a producer of these services), this implies that the data on intermediate consumption of these services in the economy (assuming that the services are consumed by businesses) could furnish a reliable estimate of imports

~~22.16~~22.20 Hosting and colocation services are exported when foreign-owned IT assets, such as servers and software, are hosted in a domestic data center. Similarly, these services are imported when locally owned ICT assets are hosted in a foreign data center. The investment in the ICT assets should be recorded in the economy of their owner.

2. Data assets

~~22.17~~22.21 The emergence of data as an important type of intellectual property product is among the ways in which digitalization has transformed the economy. In the digitalized economy, many enterprises owe much of their value to their holdings and uses of data, and many products and production processes depend on data. ~~Digital~~ These enterprises' data assets enable them to match suppliers, products, or information to buyers' needs. In particular, e-tailers and online platforms use data to produce matching services, either of customers with the product that suits their needs, of users with each other, of producers with consumers, of advertisers with viewers, or of funders with borrowers Moreover, ~~, and~~ producers of all types, ~~-~~including governments, use data for purposes such as developing and implementing product or program improvements, ~~-~~improving operational efficiency and customer experiences, planning, and marketing.~~.~~

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22.22 Data as an asset is defined as information content that is produced by accessing and observing phenomena, and recording, organizing, and storing information elements from these phenomena in a digital format and that provides an economic benefit when used in productive activities. Digitized information that does not provide a direct economic benefit to its owner, including ancillary data generated as a by-product of the producer's operations, is excluded.

22.23 Data ~~assets are~~ is produced when information on observable phenomena (OP) such as facts, behaviors, and characteristics is recorded, organized, and stored in digital format. In the next step in the data-information value chain, database assets are created by structuring and formatting the data to enable efficient retrieval and analysis. Databases consist of files of data organized in such a way as to permit resource-effective access and analysis. They do not include the data or the database management system (DBMS) software. The cost of producing databases includes planning and implementing the structure and design of the database and preparing the data to facilitate its analysis.

~~22.18~~22.24 In the last step of the data-information value chain, the owner of the data ~~Producers~~ derives economic benefits from data ~~assets by creating databases that bring together data from different sources and that are organized and structured to facilitate analysis, and~~ by extracting insights and knowledge via the~~is~~ analysis of the data. (The owner of the data could also derive economic benefits by selling the data, in which case different steps of the data-information value chain will be performed by different data owners.) The types of intellectual property products created ~~as part of~~ by producing and analyzing data~~this value chain~~ include ~~databases,~~ software, research and development, and mineral exploration. The cost of acquiring data used only once to develop an intellectual property product ~~is~~ may be included in the value of the intellectual property product.

~~22.19~~22.25 Despite their conceptual difference, data and databases are difficult to measure separately because they are produced with similar inputs and because transactions prices generally reflect the combined value of the database and the data. For reporting purposes, data and databases are therefore combined into a single detailed intellectual property (IP) product called *data and databases.* This detailed product is then combined with *software including artificial intelligence* to form a higher-level class of IP product. (Refer to Table 11.4, Treatment of Intellectual Property, in *BPM7*, for details on the recording of data and databases in balance of payments and to the discussion of intellectual property products in SNA2025 chapter 11 for general guidelines.)

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~~22.20~~22.26 Most data assets are produced internally. The value of own-account data assets is measured by their cost of production. This cost includes the expenses to develop a data production strategy, to collect and record the information elements of interest, and to gain access to information on the OP.

~~22.21~~22.27 Data assets can also be acquired in purchase transactions. Purchasing data may represent either fixed capital formation or intermediate consumption of data services depending on the duration of the use of the data in production and the limitations on the purchaser's use of the data. The sale of the data original, which would include rights to sell copies of the data or licenses ~~access~~ to use the data and all other ownership rights, transfers ownership of the data asset to the purchaser. Copies of long-lived data with general rights to use the data in production for more than a year are also classifiable as fixed assets of the purchaser. However, ~~a non-exclusive right to access a copy of the data for a limited or specific purpose will generally be treated as a service. T~~the right to use a purchased copy of the data for less than a year is a service analogous to an operating lease. The sale of information derived from data, which must be distinguished from a sale of the data, is a service. Cross-border transactions in data assets are recorded in the services account (refer to BPM7 chapter 11 Services Account for further details).

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22.28 Digital platforms ~~often~~usually collect data on their users ~~and the content they create~~. If the subjects of the data collection receive payments for ~~granting~~ access ~~agreeing~~ to the collection of data on ~~to~~ their OP, those payments are ~~also~~ part of cost of producing the data asset. However, p~~P~~ayments for authorization to collect data on users' OP are classified as distributions of income rather than as services and hence included in rents. Agreeing to collection of one's data (such as when visiting a free online platform after accepting the license agreement) does not fall within the definition of production and is therefore not a service. (Platform users who receive payments for undertaking specific actions to assist the collection and recording of data on their OP do supply a service, but such cases are likely to be too rare in practice to be worth distinguishing.)

~~22.22~~22.29 Payments for ~~a licenseto collect data on~~ access to data collection on an individual's OP are classified

with rents because being the subject of the data collection is not to be considered ~~as being~~ equivalent to supplying a service. However,~~,~~ ~~but~~ this treatment should not be taken to imply that permission ~~a~~to collect a subject's ~~license~~ data confers access to a non-produced, nonfinancial asset, as specified in the definition of a rent in paragraph 8.17. ~~Although rents are payments for access to a non-produced nonfinancial asset, in the case of payments for authorization to users' data, the right to control one's data, and the general right to privacy, are not the type of asset that is recordable on a balance sheet as ownership rights cannot exercised over them.Privacy~~ rights ~~are not an asset that can be recorded on the balance sheet~~.

22.2322.30 The SNA asset boundary for fixed assets includes produced assets used in production for more than a year, so data that will be used in production for more than a year is conceptually a fixed asset. However, many types of data (including behavioral data used for targeted advertising) tend to have a relatively short service life. The value of the goods and services produced with inputs of shorter-lived data conceptually includes the value of that data. ~~Therefore,~~ When ~~it is~~ feasible, ~~to treat~~ the cost of production of data whose service life is clearly short (e.g., data that is stored for only a short time) should be treated as intermediate consumption rather than fixed capital formation~~., it will be appropriate to do so.~~ .

22.2422.31 An ~~establishment's~~ enterprise's own-account production of data may include both data with a service life shorter than a year and data with a service life longer than a year, ~~In practice,~~ In these cases, the information needed to separately identify the costs of producing the short-lived data and the costs of producing the long-lived data is often unavailable. When the separate cost of producing the short-lived data is unknown, a relatively short average service life that reflects the inclusion of the data with a service life shorter than a year may be used to estimate the value of the combined stock of data assets. ~~the cost of producing long-lived data may be hard to estimate separately from the cost of producing short-lived data, making it necessary to estimate the combined cost of producing data and then split the combined estimate into short-lived and long-lived components based on an assumed ratio. As an alternative to splitting the combined estimate of the cost of producing data based on a ratio of production of short-lived data to production of data in general, a relatively short service life data assets as estimated in practice may be assumed to reflect the presence of types of data with a useful life of a year or less.~~ Although including expenses that do not create economic benefits in future years in the estimate of fixed capital formation has the disadvantage of caus~~inges~~ producers' gross value added to be overstated, this disadvantage is outweighed ~~alternative to the ratio approach does have~~ by the advantage of capturing the potentially important value of the stocks of data whose useful economic life is a year or less ~~in~~as part of the measure of the stocks of the data assets. Service lives for data of under a year are common, so if the measure of the production of data does not exclude all the data with a service life of a year or less, a relatively short assumption for the service life of data assets is likely to be appropriate.

22.2522.32 Expenditures to update or add to an existing own-account data asset are also capitalized. Suppliers of software and connected equipment with embedded software or AI systems often collect data on users to update or add to their data assets. Expenses to collect users' data for these purposes are part of investment in data assets. ~~Data and databases are conceptually distinct types of intellectual property products, but they are produced using similar inputs and measuring them separately is often difficult. Moreover, transactions in databases generally include the value of the data stored in the database. Data and databases are therefore combined into a single detailed class of intellectual property (IP) product known as *data and databases*. This asset type is then further combined with *software including artificial intelligence* to form a higher-level class of IP product. (Refer to Table 11.4, Treatment of Intellectual Property, in *BPM7*, for details on the recording of data and databases in balance of payments and to the discussion of intellectual property products in SNA2025 chapter 11 for general guidelines.) Nevertheless, *data* is separately identified in the label of these IP product classes because "data" refers to the information content that has been recorded in digital form while "databases" refers to the design, structure, and organization of the files to permit efficient access to the data they contain. The costs of producing a database include planning and implementing the structure and design of the database and organizing the data to facilitate its use.~~

3. Artificial intelligence (AI)

22.2622.33 22.35 Artificial intelligence refers to capabilities of a computer program, or system controlled by a computer program, of recognition, reasoning, communication, and prediction that emulate human

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recognition, reasoning, and communication. Machine learning, in which data enables an AI software program to learn to predict or classify from experience, is often used to develop or improve AI programs, and AI systems rely on a combination of software and data to generate their output. Furthermore, deep learning (a type of machine learning) enables some AI programs to improve from experience while being used in production. Although they perform tasks that normally require human intelligence, AI programs often use data beyond a scale that humans could analyze.

~~22.27~~22.34 Many of the innovative products and product capabilities associated with digitalization are made possible by AI technologies. Among these are text mining, computer vision/image recognition, speech recognition, natural language processing, personalized recommendations, and content creation with the help of generative AI. Applications of AI include translation, predictive modeling, risk assessment by lenders and insurers, data analytics, writing summaries of the content of large textual data ~~bases~~sets, smart robots, autonomous drones and vehicles, face recognition, fraud detection, and cybersecurity. AI has greatly expanded the types of jobs or job elements potentially subject to automation ~~and it also has the potential to affect patterns of international trade by facilitating digital ordering and changing relative costs of production~~.

~~22.28~~22.35 The transformative impact of AI calls for the provision of granular data on AI intellectual property assets to permit analysis of questions about the use~~the prevalence~~ of AI and ~~of questions such as~~ the effect of AI on labor markets and production ~~or international trade~~. To support the provision of this data, AI systems ~~are~~ should be distinguished as a special type of software within a class of intellectual property product identified as "Computer Software, including Artificial Intelligence Systems," with the separate reporting of AI encouraged as an "of which" item. AI is also distinguished as a type of intellectual property product in the definition of this product group. AI is classified as a special type of software even though AI systems frequently include data and hardware elements, because the system is controlled by software even when these elements are present. However, the equipment that contains an embedded AI system (or other embedded software) is still classified as equipment.

~~22.29~~22.36 The general compilation guidelines for software, data and databases in chapter 11 of the 2025 SNA/chapter 11 of BPM7 also apply to AI software, but AI uses data and machine learning in ways that present some special issues. Data plays a critical role in training AI software, and data ~~databases are~~is often acquired and organized in a database ~~created~~ for the specific purpose of training an AI software program. In addition, AI programs often ~~refer to a~~ use data~~base~~ to generate their output. The value of the data used to train an AI software product or to help AI software to generate its output should be recorded separately from the value of AI software, as the data could have multiple uses. However, data assembled in a database ~~created~~ solely as a step in the production of an AI computer program and that cannot be re-used may be included in the costs of producing~~tion~~ AI programs, ~~if the sum of costs method~~cost of production~~ is used to value the relevant assets~~AI program~~.

~~22.30~~22.37 ~~In contrast to fixed assets' usual pattern of deterioration in performance over time due to obsolescence or physical decay, t~~The performance of an AI software program with learning capabilities may improve as the program is used. Fixed capital formation is not recorded in connection with learning from experience by AI software for pragmatic reasons, as the associated cost is likely to be small. However, the depreciation rate of the AI software fixed asset may be adjusted. Learning from experience ~~may~~ can costlessly extend the service life of an ~~many~~ AI program~~s~~, making it appropriate to assume a long life for the asset. (Learning from experience by AI software is not the only source improvements in the performance of software that is already being used: many software products receive automatic ~~software~~ updates delivered over the internet ~~may also have this effect~~.)

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4. Nonfungible tokens (NFTs)

~~22.31~~22.38 Nonfungible tokens (NFTs) are digital records hosted on a blockchain that are associated with a digital or physical asset or product but that are distinct from that asset or product. NFTs certify ~~ownership of~~ rights to use and benefit from the asset and may also serve to certify the asset's authenticity. They are nonfungible because the associated asset is unique and not interchangeable with other assets in the same class the way that the units of a fungible crypto assets are. Payments for NFTs usually must be made in the fungible crypto asset native to the blockchain on which the NFT is hosted (see paragraph 22.85 for the description of fungible crypto assets).

~~22.32~~22.39 NFTs are classified into three classes: (1) those that convey no ownership rights and only allow for

personal use of a~~nother~~ specified asset or product; (2) those that convey limited ownership rights, beyond personal use for a ~~nother~~specified asset or product; and (3) those that convey full ownership rights for ~~another~~a specified asset or product. The main classification of NFTs is based on the type of rights conveyed rather than on the characteristics of the associated asset or good. The purchase of an NFT could, based on these rights, be classified as consumption, as an acquisition of a non-produced asset, or as neither (assuming that the purchase of the associated asset has~~is~~ already been recorded). However, NFTs vary widely both in the ownership rights they convey and in the type of digital and physical asset or good to which they are linked.

~~22.33~~22.40 NFTs that convey no ownership rights and only allow for personal use of a~~nother~~ specified asset or commodity (e.g., the right to display a video clip of a scoring play in a sporting event or of a piece of digital art for non-commercial purposes) are in the first category. The purchase of an NFT that only gives rights to personal use of an item is treated as consumption. This type of NFT is not an investment item because it cannot be used in production and generally does not serve as a store of value. However, in rare cases, an NFT in this category that commands a high price when first auctioned and that has enough exclusivity and appeal to have a lasting value may qualify as a valuable. Treating the initial purchase of NFTs in this class as a consumption expenditure implies that their creation represents ~~the~~ production ~~of a service~~. In the case of cross-border transactions in this type of NFT, such services are recorded under relevant category depending on the content of the related asset ~~computer and information services~~.

~~22.34~~22.41 The second type of NFT conveys limited ownership rights to a~~nother~~ specified asset or commodity that go beyond personal use to include use for commercial purposes. NFTs that convey limited ownership rights are in the SNA/BPM asset class containing contracts, leases and licenses if they confer valuable benefits that the holder can realize in practice. Assets in this class are non-produced, nonfinancial assets. The ownership rights conveyed to the NFT holder may affect the value of the encumbered asset. Further information on contracts, leases and licenses is provided in SNA chapter 27/BPM chapter 14.

~~22.35~~22.42 The third type of NFT conveys full ownership rights. NFTs that convey full ownership are a method of recording and verifying ownership of an underlying asset. Th~~at~~ underlying asset should already be recorded in the national accounts. An NFT that conveys full ownership is a digital recording of ownership similar to a property title, not a separate asset. Purchasing an NFT in this category is therefore a way of purchasing the underlying asset. In the case of cross-border transactions in this type of NFT, if the underlying asset is digital or physical, it is treated based on the existing principles for recording such assets ~~(goods or computer services). If the underlying asset is a physical asset (e.g., a house property), treatment follows the existing principles for recording such assets.~~

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C. Digital Platforms

~~22.36~~22.43 ~~Operators of dDigital platforms – also known as online platforms – use digital technology to supply a digital services that facilitate interactions via the internet between two or more distinct but interdependent sets of users (either firms or individuals), who interact through the service via the internet. Because they~~ Platforms help users to connect with and interact with other users. P~~, p~~latforms are therefore subject to network effects. (Network effects ~~which arise~~occur when the value of a platform or product to each user ~~depends on~~increases as the number ~~with~~ of ~~other~~ users of the platform or product rises ~~or family of products.~~) The opportunities for beneficial interactions with other platform users increase with the number of users in general or the number of users on the other side of the platform, so adding users makes the platform's services more valuable. For example, increasing the number of sellers on a platform makes it more attractive to buyers and increasing the number of buyers makes it more attractive to sellers; similarly, increasing the audience size raises the prices that advertisers are willing to pay ~~for the platform's services. Online platforms deliver their services via the internet, and digital platforms also known as online platforms.~~

22.44 Digital platforms – also known as online platforms – supply a digital service that facilitates interactions between two or more distinct but interdependent sets of users, who interact through the service via the internet. Digital (or online) platforms ~~are conceptually distinct~~ differ from suppliers of e-commerce margin services (or e-tailers) ~~e-commerce firms~~ because ~~e-commerce firms~~they do not take possession of the goods ~~or directly produce the services~~ sold on the platform. They also differ from other producers operating digitally because they intermediate, rather than produce, the goods and services sold on the platform. ~~they sell.~~

However, ~~An establishment that sells its own merchandise and an establishment that facilitates selling by others can, however, both be part of the same multi-establishment enterprise. Furthermore, e-commerce firms and~~ online platforms and e-tailers ~~both~~both ~~use~~ data to produce matching services, either of customers with the product~~s~~ that suit~~s~~ their needs, ~~of users with each other,~~ of producers with consumers, of advertisers with viewers, or of funders with borrowers. To take advantage of the synergies in technology, an ~~establishment~~enterprise might combine ~~that~~ selling~~s~~ its own merchandise via digital ordering (i.e., ~~an e-~~tailing~~er~~) and ~~establishments that operate~~ operating a digital platform that facilitate~~s~~ selling by others. ~~may be part of the same multi-establishment enterprise~~.

22.45 ~~Digitally-enabled~~ Digital intermediation services facilitate transactions between multiple buyers and multiple sellers in exchange for a fee, without the unit providing the intermediation services taking economic ownership of the goods or rendering the service being intermediated. These services ~~of~~ matchi~~ng~~ producers and ~~with~~ consumers with each other ~~or funders with borrowers~~ and facilitate their transactions~~are known as digital intermediation. Digital intermediation is a service in which digital technology and data are used to match parties that desire to transact with each other and to facilitate their transactions.~~

~~22.37~~22.46 Some digital platforms are free, while other fee-based platforms facilitate financial transactions or interactions that do not involve a transaction. There are therefore ~~three~~ four types of digital platforms:

a. *Nonfinancial digital intermediation platforms* (DIPs) facilitate transactions between multiple buyers and multiple sellers for the ordering and delivery of goods and services for a fee or commission~~,~~ without taking ownership of the goods, or rendering ~~and~~the services, that are being sold (intermediated).

b. *Free online platforms* facilitate non-commercial interactions between users or provide entertainment and information services and are usually funded by advertising and the collection of data on their users.

c. *Financial digital platforms* ~~Finally, *financial digital intermediation platforms*~~ intermediate ~~mediate~~ funding or payment transactions for a fee. Financial digital platforms~~DIPs~~ are discussed ~~below~~ in ~~the~~ section ~~E~~D on digitalization and the financial system.

~~c.~~d. *Other fee-based digital platforms* facilitate interactions between users other than transactions in goods and services or financial transactions. Online dating and matrimonial platforms ~~are~~ ~~an~~ examples.

1. Nonfinancial digital intermediation platforms (DIPs)

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~~22.38~~22.47 In addition to helping buyers and sellers of goods and services to find each other, nonfinancial DIPs facilitate ordering, payment for, and delivery of, goods and services supplied by institutional units on the seller side of the platform to institutional units on the buyer side of the platform. DIPs charge fees for these digital intermediation services. To increase parties' willingness to transact, they may also provide quality assurance through steps such as vetting the parties that have access to the platform.

22.48 The output of a DIP consists of digital intermediation services, which are recompensed through a fee. It does not include the goods and services that the DIP helps others to sell. The possible consumption of the platform's services by the users on the two sides of the platform is shown on the sides of the triangle in Figure 22.1. The seller/producer and the buyer/consumer both consume intermediation services in the case ~~in whichthat~~where they are separately invoiced for the services supplied by the platform. In the case~~s~~ where~~that in which~~ all fees for the platform's services are invoiced to the seller/producer, only the seller/producer is recorded as consuming the intermediation services, and similarly, only the buyer is recorded as consuming the intermediation services in the case~~s~~ where~~thatin which~~ all fees for the platform's services are invoiced to the buyer. However, in all cases, the buyer using the DIP consumes the good or services supplied by the seller/producer using DIP, as shown at the base of the triangle.

~~22.39~~22.49 Nonfinancial DIPs often accept ~~customers'~~ buyers' payments for the goods and services produced or sold by platform users and deduct their intermediation service fee from the amount passed through to the producer/seller ~~of the goods and services~~. To capture the economic substance of the transactions in which the platform passes on the payment for the good or service after deducing its fee or commission, these payment

flows must be rerouted to include a ~~direct~~ sale of ~~the output~~ good or service by ~~of~~ the producer/seller~~s~~ using the platform to the buyer~~s~~ using the platform and a purchase by th~~os~~e producer/seller of the intermediation services supplied by the platform. The approach to recording the transactions of a DIP in which the producer of the intermediated good or service~~s~~ consumes ~~is treated as the purchaser of~~ the platform's intermediation services is known as the producer approach. The transactions recorded ~~for a DIP~~ after any necessary rerouting to implement the producer approach are those shown on the left side and at the base of ~~in~~ Figure 22.1.

Figure 22.1. The Possible Types of ~~Producer Approach to~~ Transactions of a Digital Intermediation Platform~~s~~

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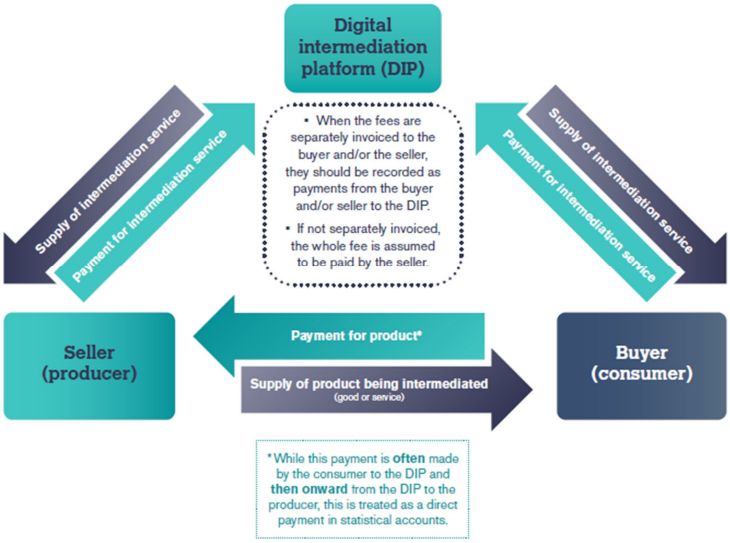

Source: *Handbook on Measuring Digital Trade*, 2nd edition..

22.50 Handling the case when the platform's fee is implicitly included in the price of the intermediated product by recording transactions in which the buyer purchases the product directly from its producer or seller and the producer/seller purchases intermediation services from the platform has some important advantages. This approach allows the ~~production~~supplying of the goods and services sold on DIPs to be recorded in the appropriate industry and the consumption of those goods and services to be recorded in the appropriate class of commodities. It also accounts for the effect of the intermediate consumption of the services of the DIP on the producer's value added. (A complete ~~picture~~portrayal of the services of DIPs and the value of the products ordered through DIPs may be provided in~~as part of~~ a thematic account on the digital economy or a ~~set of~~ digital supply and use table~~s~~.)

~~22.40~~22.51 The buyer is recorded as purchasing intermediation services from the DIP in cases when the DIP separately invoices the buyer for its services. However, in these cases the buyer's payment for the good or services must still be rerouted to record a purchase of the good or service from its producer/seller, and, if a fee is deducted from the amount passed through to the producer/seller, a purchase of intermediation services by the producer/seller. In addition, s~~S~~ome DIPs seek to attract buyers to the platform by using a portion of the fees received from sellers to pay rebates to buyers. The rebates represent a reduction in the price of the

goods and services supplied by the seller and are also not part of the fee (or price) that the platform retains for its intermediation services. The price received by the seller must therefore be measured by the net price after the rebate, and the fee recorded as received by the platform for its services must exclude the amount that funds the rebates. The rebate payment must therefore re-routed to show that it is paid by the platform to the seller and then paid by the seller to the buyer, with each rebate representing a reduction in the price received by its payer. ~~The recording of the transactions of the DIP and its users follows a different approach when the DIP invoices the buyer separately for its services and for the intermediated product. In this case, the buyer is recorded as purchasing intermediation services from the platform and as purchasing the intermediated product from its producer (or seller). The DIP may also charge a fee for its services to both the buyer and the seller of the intermediated product. In this case, three transactions are recorded because both the buyer and the seller are recorded as purchasing intermediation fees from the DIP, and the buyer is recorded as also purchasing the intermediated product from its seller.~~

~~22.41~~22.52 Digital intermediation services are frequently supplied across international borders by non-resident platforms. Goods and services supplied by resident producers ~~and consumed by~~to resident buyers via transactions intermediated by a non-resident platform should be recorded as produced and consumed in the compiling economy. Further, the fee or commission received by the DIP should be recorded as an import of digital intermediation services of the compiling economy. Therefore, if the non-resident platform deducts its fee from the buyer's payment for the good or service, the buyer's payment must be rerouted so that the producer/seller is recorded as selling the good or service to the buyer and importing the digital intermediation service. (Refer to BPM7 Chapter 11 the Services Account, for details on the specific recording in balance of payments.) ~~I~~Similarly, in the case of ~~f~~ a resident DIP collectings a cross-border payments ~~for the goods and services~~ on behalf of a non-resident producer/seller providing a good or service to a non-resident buyer and deducting its fee from that payment, ~~that it intermediates, this will require rerouting~~ the buyer's payment is rerouted to go to ~~so~~the producer/seller and ~~that~~ an export of the services of the DIP to the economy of the seller/producer is recorded. ~~the goods and services are not treated as being imported at the net price received by their producer and then exported at a marked-up price paid by their buyer.~~

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~~22.42~~22.53 Digital intermediation ~~services~~ platforms can also facilitate exports by resident suppliers of goods or services, or imports from foreign suppliers of goods or services. Digital intermediation services used by an exporter ~~are~~should be included in the value of the exported good or service. For example, if a DIP located in country A facilitates the supply of a service by a resident of country B to a resident of country C, the price paid by the buyer in country C is the value of service exported by country B and imported by country C. ~~, and t~~The fee or commission charged by the platform is then the value of digital intermediation services exported from country A and imported by country B. Domestically produced digital intermediation services used by the producer of an imported good or service should conceptually be treated as an export of services and ~~included in~~ the value of the imported good or service should be measured by price paid by its buyer. However, this treatment may require rerouting the fee or commission paid to the DIP to pass through the foreign producer. If the source data to compile these rerouted flows are unavailable, assumptions (or international cooperation) may be needed to impute the rerouted flows.

22.54 ~~In general, s~~Services sold for a fee or commission are usually straightforward to measure, but ~~in the case of~~measuring the intermediation services of DIPs and the goods and services transactions that they intermediate can present ~~,~~ compilation challenges ~~are common~~. Rerouting the payments collected and fees retained by a DIP ~~to the producers of the intermediated goods and services~~ may require data that are ~~generally~~ unavailable, making assumptions necessary. ~~Also, producers of services supplied via a DIP may be hard to distinguish from employees of the producer of the digitally order services. determining whether intermediation services are being provided may be difficult because transactions between platform users may be hard to distinguish from transactions in which the platform takes possession of the good or uses the service as an intermediate input to produce a different service, or is acting as an employer. These latter cases should be treated as e-commerce activity.~~

~~22.43~~22.55 Furthermore, by allowing producers to interact with previously unreachable consumers, including those in other geographical locations, DIPs have provided selling opportunities to producers previously excluded from the market. Selling opportunities created by DIPs have led to growing activity by informal household enterprises, which are likely to be missing from business registers and other standard sources of statistical information. They have also contributed ~~led~~ to the rapid growth of small international transactions in goods and services that may be below de minimis thresholds for customs duties and documentation

requirements. Another common compilation challenge from DIPs providing cross-border intermediation services is that source data on DIPs with no local presence and on the activity that they intermediate is not easily available.

2. Free online platforms and free digital products

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~~22.44~~22.56 Digitalization has been marked by a broad-based expansion in the availability of free products, in many cases provided by online platforms~~the emergence of free online platforms as part of daily life and a general expansion in the availability of free digital products~~. The SNA framework that values the free outputs of nonmarket producers such as nonprofit institutions funded by donations by the cost of production does not apply to most of these free digital products because they are supplied by a commercial enterprise. The outputs of commercial enterprises are valued by their price, which is zero in the case of a free product. The emergence of free online platforms and products as part of digitalization has therefore raised questions about whether the output of the digital economy is fully included in GDP.

~~22.45~~22.57 Free products supplied by market producers are included in GDP as part of the price of other products they help sell or with which they are bundled either directly or indirectly. Taken together, the items in the bundle generate at least enough revenue to cover the operating costs of the supplier of the free product, so the overall output of the supplier of the free digital product is not undermeasured. Free products are supplied by both platform firms and non-platform firms.

Free products supplied by non-platform firms

~~22.46~~22.58 In the non-platform case, the free output and the priced output are marketed to the same set of customers, and the function of the free output is to promote sales of the priced output to those customers. Suppliers of digital products frequently adopt a "freemium" pricing strategy, in which a free basic version of the product promotes sales of upgrades or a premium version of the product. In these cases, the price of the promoted output includes a mark-up that covers the cost of supplying the free output that has facilitated its sale.

~~22.47~~22.59 Rather than being free, the promotional output may have a low price that is subsidized by the fully priced product. For example, a low-priced basic version of a software product may require the purchase of an upgrade or a complementary software product to unlock desirable features or capabilities, ~~printers may boost the sales of high-priced ink cartridges, with the price of the printer supplies funding the subsidy to the printer's price. Taken together, the sales of the items in the bundle give the value of the producer's output~~.

~~22.48~~22.60 Although a zero or artificially low price of an output that is cross subsidized by the price of another output of that same producer does not cause undermeasurement of the producer's total output, it does affect the measurement of the composition of the producer's output. The relative values ascribed to the items in the bundle can matter for the measurement of fixed capital formation if a free or cross-subsidized item used for fixed capital formation is bundled with items used for intermediate consumption, such as the supplies needed to operate a piece of equipment, or the training, maintenance and helpdesk services needed to use a free software product. Also, the relative values assigned to the various parts of the bundle could affect the measurement of exports, imports, or trade patterns if a multinational enterprise sources parts of the bundle from different countries. Finally, the effect of these relative values on the weights of the price and volume indexes could matter for measurement of the volume growth of GDP if the prices of the items in the bundle behave differently.

Free online platforms

~~22.49~~22.61 Most free online platforms are organized as commercial enterprises. Two-sided (or multi-sided) commercial platforms often charge a price for their services to the users on one side of the platform and supply free services to the users on the other side of the platform to attract and retain those users. The platform users attracted by free services increase the value of the platform's services to the users on the priced side of the platform. The users who fund the platform by purchasing priced services recoup this expense as part of

the transactions with the users on the free side of the platform enabled by the platform's services.

22.62 Free online platforms offer services such as social media, search, and access to content providing entertainment and information. Commercial free online platforms are generally funded by advertising and the collection of data on their users, while offline ~~non-digital~~ free radio and television broadcasters are funded just by advertising. The data is used as input in the platforms' production of advertising services. However, the data, or information derived from the data, may also be sold or used for own-account production of software and R&D.

~~22.50~~22.63 Platforms funded by advertising services frequently assemble the audience that the advertisers want to reach by supplying free services. They then include the cost of supplying the free services needed to assemble the audience in the price charged to advertisers. The advertisers, in turn, include the cost of the platform's advertising services in the price of the product sold with the help of the advertising. Both the platform and the firms that advertise on the platform receive at least enough income from the prices at which their output is sold to cover their operating costs. The standard method of measuring the value of a market producer's output by the producer's sales is therefore applicable to both the platform and the funder side users of the platform. Furthermore, households' expenditures on the products advertised on the platform include the cost of the platform's services embedded in the price of the advertised products.

~~22.51~~22.64 Digital platforms ~~that~~ collect and store data on users to produce data assets as a type of own-account investment, ~~(~~ and they may also license others ~~sell rights~~ to use the data or even sell the data~~)~~. The value of own-account investment in data assets is usually measured by the cost of production. However, the platforms may also compile ~~collect~~ short-lived data on recent browsing behavior that is used as an intermediate input for targeted advertising. The value of this short-lived data is part of the price of the advertisement targeting services. More generally, short-lived user data collected by digital platforms can be assumed to be used for intermediate consumption, with its value embedded in the price of the products it helps produce.

~~22.52~~22.65 A few free online platforms (such as public wikis created and maintained by communities of volunteers) are owned by a nonprofit institution serving households and operate as non-market producers, meaning that their output is not sold for an economically significant price. The output of non-market producers is valued by the cost of production. Nevertheless, the production costs of nonprofit free platforms may be modest in comparison with physical indicators of its output such as number of visits or scale of content it hosts because volunteers may do much of the work. The work of volunteers is outside the production boundary of the SNA but could be included in an extended account on unpaid household service work.

Content created by platform users

~~22.53~~22.66 Many u~~U~~sers of free platforms create content such as videos, images, text, and audio, both as a leisure activity and for commercial purposes such as receiving advertising revenue. Creating content for leisure purposes is outside the SNA production boundary. If the content creator does not receive remuneration, the content is assumed to be created for leisure purposes. Households that receive monetary remuneration from an advertiser or platform for use of their uploaded content may be considered unincorporated household enterprises supplying services to the advertiser or platform. In the case of a platform that takes its fees for services out of the payments from advertisers that are passed through to the content creators, the content creators should be treated as the purchasers of the platform's services and the producers of the services used by the advertisers. If the purchaser is a non-resident, the service should be included in exports of services.

~~22.54~~22.67 Depending on the context, user-generated content can refer either to content created by the users of a brand's products (customers and brand advocates), or to content created by the users of an online platform. The economic benefits that free platforms receive from platform user-generated content include attracting users to the platform, selling advertising, and adding to the platform's stock of data assets. These economic benefits are a positive externality of the sort that frequently arises from producers' interactions with their customers and are not a basis for inferring that the creator of the unpaid user-generated content has produced a service used by the platform. However, the cost of supplying free services to the platform users who create content may be included in the platform's own-account investment in data assets. Furthermore, an extended

account with an alternative approach to measurement of households' consumption of the services of free platforms can optionally treat user-generated content as a service produced with inputs of the platform's free services and used by the platform as an input in its own-account production of data assets.

~~22.55~~22.68 In addition to posting content on free platforms that receive advertising revenue, content creators may publish on digital platforms that collect subscription fees on their behalf in return for a share of the fees. Although most of this content is likely to have a short economic life, content created for commercial purposes that yields economic benefits for the content creator over more than a year is an intellectual property asset of the creator classified as long-lived entertainment, literary and artistic originals.

Free Software

~~22.56~~22.69 Software products are often free to download, although the services of the platform hosting the software code may not be free. The free software may be used by households for final consumption, or it may be used in production. Copies of free software are frequently supplied across borders. In addition, free code shared by software developers on code hosting platforms that facilitate collaboration plays an important role in software development.

~~22.57~~22.70 App stores are a type of DIP on which some of the software items ~~where the service that is intermediated~~ available for ~~(the app that~~ households to download to their phone or other device are ~~) is~~ often free. Free and subsidized apps used by households may be funded by advertising~~, by~~ and collection of data ~~on their user~~, by purchases of premium versions or other items that they encourage, or by other services whose use they facilitate. Like the services of an online platform funded by advertising, the services of apps funded by advertising are purchased indirectly as part of the price of the advertised product.

~~22.58~~22.71 Open-source software refers to free software whose source code is publicly available under a license to copy, use, inspect, modify, and share. Open-source software is used in production by corporations, governments, and nonprofit institutions. It is usually developed, maintained, and supplied by a corporation, university, government unit~~research office~~, or nonprofit institution whose investment to develop the open-source software original would be included in a general estimate of own-account software investment based on costs of production, such as the compensation expense for software developers.

~~22.59~~22.72 A complex open-source software product may contain components developed in multiple economies, as the development of complex software products is often spread across multiple locations. Depending on the circumstances, it may be appropriate to allocate the investment to develop the open-source software product among the economies in which the development work takes place, or it may be appropriate to attribute the entire investment to the economy of residence of the owner of the software asset. In the case of software produced by a multinational enterprise, the headquarters or one of the foreign affiliates may acquire full ownership of the software original by funding the software's development.

~~22.60~~22.73 Even though open-source software does not generate licensing fee income for its developer, it can qualify as an asset of its developer. The producer of an asset is an economic owner if the producer bears the risks of production in order to claim benefits associated with the use of the asset. Open-source software developed by corporations is usually funded through sales of complementary services, such as training and support, or by other products it helps sell. Open-source and other free software may also help increase the number of users on a platform or enhance the developer's reputation and profile. Open-source software supplied across borders may be funded by cross-border sales of complementary services or other products.

~~22.61~~22.74 Open-source software is sometimes developed by individuals working independently. Unpaid production of open-source software originals by volunteers is outside the SNA production boundary. However, independent developers of open-source software for commercial purposes are unincorporated household enterprises investing in own-account software.

~~22.62~~22.75 The value of open-source software copies supplied by enterprises may be embedded in the price of complementary outputs that the open-source software helps sell or that are bundled with the open-source software. These purchased outputs may be software or services used for intermediate consumption. If software users substitute open-source software funded by mark-ups on intermediate consumption items for explicit purchases of software, the standard procedures will still correctly measure the total output of the

supplier of the free software but the breakdown of the uses of that output will omit the use for software investment. Measured software investment will also be reduced if software users substitute open-source software distributed by a government entity or nonprofit institution operating as a non-market producer for purchased software.~~,. The SNA values outputs of nonmarket producers such as the free software by their cost of production, not the willingness-to-pay of the users of these outputs that could be inferred from the price being paid for of a competing substitutecommericalcommercial product with similar capabilities even if such a price would beis available.~~

Increasing the Visibility of Free ~~online~~ Online ~~platforms~~ Platforms and Products

~~22.63~~22.76 The value of the free services that advertis~~er~~ing ~~-~~ and ~~-~~ data-funded digital platforms supply to households is relevant for analytical purposes and for understanding the broader impact on household consumption of the emergence of these free platforms. Alternative measures of household final consumption expenditures and the output of free online platforms that include the households' direct consumption of the services of advertisinger ~~-~~ and ~~-~~ data-funded digital platforms may be presented in an extended account on free online platforms, as discussed in Section F below.

~~22.64~~22.77 The effect of free platforms and free digital products on volume growth of household consumption is also conceptually relevant for understanding the impact of digitalization on prices and volumes. Free digital products and the measurement of prices and volumes is discussed in section E.

D. Digitalization and the Financial System

1. New Financial Services and Means of Payment Enabled by Digitalization

~~22.65~~22.78 Digitalization has resulted in the appearance of new financial service products and of new digital assets designed to be used as a means of payment. Means of payment refers to the instrument used to make the payment, such as a check, debit, or credit card. The new digital financial service products fall within existing categories of products, and the new digital assets fall within existing asset categories. However, they should be reported as "of which" items (or as part of the product detail in a thematic account on the digital economy and the associated digital supply and use tables) when they are important and can be separately identified. (*BPM7* recommends introducing "of which" categories for i) fintech companies within the subsector classification; and ii) instruments or services classifications where necessary to separate out fintech-related instruments and services.) (see paragraph 5.154 for the definition of fintech).

~~22.66~~22.79 It will usually be appropriate to provide a breakout of *financial service providers predominantly operating digitally*, which will contain the providers of financial services that primarily transact with consumers via digital channels as part of the digital supply and use tables or thematic account on the digital economy discussed below. *Financial service providers predominantly operating digitally* include financial digital platforms.~~The important types of suppliers of digital financial services include financial digital intermediation platforms~~, digital providers of insurance and reinsurance services (InsurTech), digital banking platforms operating solely online (neobanks) or predominantly online, e-money issuers, and online only foreign exchange bureaus and money transfer operators. Some important digital payment mechanisms are e-money (which includes mobile money), digital assets that are used as a means of payment including fungible crypto assets, and central bank digital currencies (CBDCs).

Commented [A17]: We may not require this reference for BPM7

2. Financial Digital ~~Intermediation~~ Platforms

~~22.67~~22.80 Financial digital ~~intermediation~~ platforms provide matching services and facilitate financial transactions between suppliers of funds and users of funds. They do not take ownership of the financial assets arising from claims on the users of funds or incur liabilities to the suppliers of funds. They receive fees or commissions for their services and are classified as financial auxiliaries (S126). They differ from conventional financial intermediaries, which incur liabilities on their own account and acquire financial assets and which charge for their financial intermediation services implicitly through interest rate margins.

22.81 There are ~~three~~ four types of financial digital ~~intermediation~~ platforms that facilitate access to funding in exchange for a fee or commission: (1) peer-to-peer and other online lending platforms, (2) equity-based crowdfunding platforms, and (3) philanthropic (or donation-based) crowdfunding platforms, and (4) reward-based crowdfunding, in which the donors to a project expect to receive a non-financial reward such as a good or service. Peer-to-peer lending platforms facilitate loans between households or from households to small enterprises. Other lending platforms match households and small enterprises seeking funding to institutional investors seeking lending opportunities. Equity-based crowdfunding platforms facilitate financing transactions in which the funders receive equity stakes in the enterprises or projects they fund. The donation and gift ~~funding~~ transactions mediated by philanthropic crowdfunding platforms are current transfers or, potentially, capital transfers, and an element of the services these platforms perform is vetting of causes that are seeking assistance. The funds advanced to project owners on reward-based platforms do not qualify as loans, as the project owner's obligation to supply the reward is contingent on the successful completion of the project.

~~22.68~~

22.82 A~~nother~~ type of financial digital ~~intermediation~~ platform whose main purpose is not to facilitate access to funding consists of crypto asset exchanges and trading platforms. Crypto asset exchanges and trading platforms allow users to buy, sell and stake (lend) crypto assets for a fee or commission. They embed their fees into their buying and selling prices. Some crypto exchanges may provide custodian services and hold crypto assets of customers for a fee. Crypto assets with a corresponding liability (e.g., asset-backed stable coins, debt, and equity security crypto assets) are classified as financial assets (see paragraph 22.76 for the classification of crypto assets). Since financial assets are generally among the assets traded on ~~a~~ crypto asset exchanges and trading platforms, ~~crypto asset exchanges~~ they are classified as financial auxiliaries.

~~22.69 Crypto asset brokers allow users to buy crypto and sell crypto assets at prices set by the broker and may also hold customers' cryptocurrencies. Theyact as intermediaries between buyers and sellers of crypto assets and embed their fees into their buying and selling prices.~~

3. Digital Representations of Value

~~22.70~~22.83 Digital assets designed to act as a medium of exchange or financial instrument are digital representations of value recorded on a cryptographically secured distributed ledger or using a similar technology or issued by a central bank as a CBDC. Medium of exchange is defined as a means for acquiring nonfinancial assets (goods, merchandise equipment, etc.), services, and financial assets without resorting to barter. Digital assets differ from e-money. E-money is monetary value stored electronically on a physical device such as card or phone or stored remotely, which represents a liability of the e-money issuer and is denominated in a fiat currency. E-money must represent general purchasing power (i.e., it can be used for making payments to a variety of other entities).

~~22.71~~22.84 Crypto assets are digital representations of value that use cryptography and distributed ledger technology (DLT) such as blockchains to enable parties to transact directly with each other without the need for a trusted intermediary. DLTs allow transactions to be recorded, synchronized, and shared simultaneously on multiple nodes in a decentralized network. Blockchains create cryptographic records of transactions and ownership that are impossible to alter without detection.

~~22.72~~22.85 Crypto assets are classified as either fungible or non-fungible. Fungible crypto assets are divisible and not unique (e.g., one bitcoin is equal to any other bitcoin and can be divided into equal pieces of similar value). Conversely, non-fungible crypto assets, commonly known as nonfungible tokens or NFTs, are unique and non-divisible (see Section B.4). Fungible crypto assets are classified into three broad categories: (1) those designed to act as a general medium of exchange (which are further divided in those with, and those without, a corresponding liability); (2) those designed to act as a medium of exchange within a platform or network (again divided into those with, and those without, a corresponding liability); and (3) security crypto assets. Security crypto assets are tokens certifying ownership of a financial instrument. They always have a corresponding liability and should be recorded as debt securities, equity securities, or financial derivative depending on the nature of the claim on the issuer.

~~22.73~~22.86 A digital assets decision tree to aid in identifying fungible crypto assets according to the above

typology and other digital assets that have a corresponding liability appears in Figure 22.2. Digital assets with a corresponding liability include CBDCs, security crypto assets, payment tokens with a corresponding liability, and most stablecoins. Payment tokens entitle the holder to future access to a good or service. Stablecoins aim to maintain a stable value relative to a specified asset such as a fiat currency or gold, or a specified basket of assets, usually by being backed (or, at least, advertised as backed) by the assets of the issuer. The stability mechanism might also be an algorithm that causes the supply of the asset to respond automatically to changes in demand for the asset.

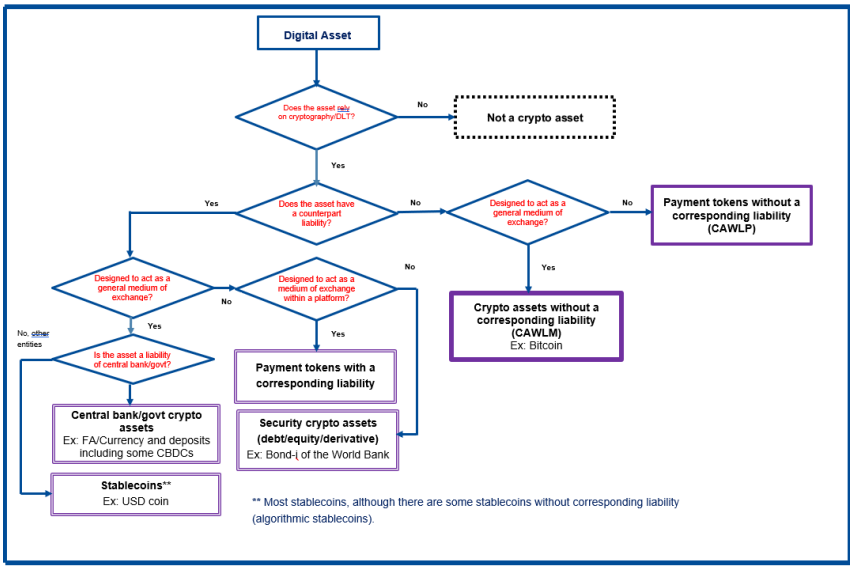
22.7422.87 All types of crypto assets are within the SNA asset boundary. Crypto assets with a corresponding liability are classified as financial assets. In particular, crypto assets with a corresponding liability designed to act as a general medium of exchange are separately identified under "currency and deposits" and those designed to act as a medium of exchange within a platform are treated as equity or debt security crypto assets., while On the other hand, crypto assets without a corresponding liability are classified as non-produced, non-financial assets within a separate category. If a crypto asset without a corresponding liability is ever able to gain widespread acceptance as a general medium of exchange, the guidance on its classification may be re-considered. The capital account, financial account, and balance sheet chapters of the SNA (chapters 11, 12, and 14) and the classification of financial assets and liabilities (chapter 5) and the capital account (chapter 14) chapters of the BPM provide additional details.

22.7522.88 Validatingon of crypto asset transactions is a service. The process of validating transactions in crypto assets is known as mining in the case of crypto assets without a corresponding liability that rely on proof of work for ensuring the security of transactions. This process includes the release of new units of the crypto asset as an implicit fee paid to the miner validating the transaction. The miner validating the transaction also receives an explicit fee in crypto assets paid by the party initiating the transaction, which is normally the sender/seller. The validation services that are rewarded with newly released units of the crypto asset are assumed to be collectively consumed by the existing holders of units of that crypto asset, while those rewarded by the explicit fee are consumed by the transactor paying the fee (normally the sender/seller). Refer to Chapter 7, *2025 SNA* and Chapter 11, *BPM7* for details on the recording of output of mining and cross-border validation services.

Commented [A18]: In BPM7, they will be included under this class with the following footnote: Countries where cross-border flows in these assets are relevant, may report them as a supplementary item under currency and deposits.

Commented [A19]: This part of the sentence will be omitted from the SNA

Figure 22.2 Decision Tree for Classifying Fungible Digital Assets



E. Measuring Prices and Volumes of Products affected by Digitalization

~~22.76~~22.89 Many of the measurement challenges arising from digitalization involve prices and volumes rather than the output at current prices. Price and volume measurement challenges are particularly common for products affected by digitalization because price change is straightforward to measure only when the products and their characteristics remain static. Digitalization has transformed household consumption and caused rapid change in products' characteristics and sources of supply. New digital products regularly disrupt existing ones, new models or service contracts frequently embody quality improvements, digital intellectual property products and services with no physical units of measurement are growing in importance, and free products often appear or cease to be free.

~~22.77~~22.90 Regular and timely refreshment of the samples of models (and outlets) used to calculate the price indexes for products subject to frequent quality improvements to keep them representative of current purchasing patterns is the first step in compiling deflators that capture these products' quality change. Secondly, the appearance of new models and the exit of obsolete models must be handled in a way that allows the price index for the product to reflect the value of the quality changes.

~~22.78~~22.91 The commonly used "matched models" procedure for handling entry of new models and exit of old ones when constructing the price index for a product considers only the price changes of the continuing models in calculating the change in the index. ~~Any m~~Models ~~are~~is excluded from the subsample used to calculate the change in the index. Leaving these models out of the index calculation has the advantage of avoiding~~s~~ the risk of counting price differences ~~due to~~caused by quality differences as inflation, i.e., as ~~a~~ price change caused by the passage of time. However, the method implicitly assumes that the quality-adjusted price of the new model equals the price of the model it is replacing (after adjusting for the general change in price of the product between the last period with the exiting model's price was observed and the first period when new model's price is observed). Newly introduced models of products benefiting from advances in digital technology often offer substantially improved quality at about the same price as the model they replaced.

~~22.79~~22.92 To capture the price and volume impact of quality changes in digital products, the prices of new models must be adjusted for the value of their quality difference from the models they replace. Hedonic

regression models relating the price to the product's characteristics are a recommended method for adjusting prices for quality change. Hedonic models that use machine learning methods to predict the price of the new model in the previous period and the price of the old model in the current period have been proposed as a technique for doing quality adjustment at scale when analyzing large datasets covering e-commerce transactions.

~~22.80~~22.93 Another technique used to adjust the price of a digital product for a quality change is options pricing, which averages observations on the differences in the price of the item caused by the presence or absence of a characteristic offered as an option. This is the same sort of adjustment that is implicitly made by a hedonic regression ~~(the results will not be the same if logarithms of prices are used in the hedonic model but not the options pricing model~~ (on hedonic regression, see chapter 18).). ~~Regardless of the quality adjustment procedure used when a quality change is observed in the data used to compile the price index,~~

~~22.81~~22.94 A price measurement problem known as outlet substitution bias occurs when buyers obtain a substantially identical product at a lower price from a new source of supply. The lower cost supplier may have appeared as part of digitalization. For example, a ride sharing DIP may offer lower prices without a significant sacrifice in quality compared to the taxis, or a good may sell for less online than offline. The impact on the average price paid of a shift in households' shopping patterns to new source of supply can be captured by compiling a unit value price index (in which the total expenditure is divided by the total quantity purchased.) However, the composition of a unit value index must be homogeneous, as the maintained assumption is that all the items included in its calculation have the same per-unit intrinsic value. (Under the weaker assumption that the average quality of items being purchased is not falling, a unit value index can provide an upper bound measure of inflation in price of the product.)

1. Measuring quality change in ICT goods and goods with ICT components

~~22.82~~22.95 Frequent quality changes in ICT equipment and ICT durable goods enabled by rapidly advanc~~e~~es in~~g~~ semiconductor chip technology have presented~~been a~~ challenges for price index compilers ever since ~~the emergence of computing devices based on~~ this technology was first commercialized. New models of ~~these~~ICT goods have often offered a substantial improvement in performance at almost the same price as the previous model, yet the widely used "matched models" method for price index compilation implicitly assumes that the quality-adjusted prices of the two models in an overlap period are the same. Furthermore, the spread ~~the measurement problem~~ of quality changes enabled by semiconductors beyond ICT goods ~~has spread as digitalization has proceeded, as embedded semiconductors and software now enable quality improvements in~~to many kinds of equipment and durable goods with ICT components, including motor vehicles, is an important element of digitalization.

~~22.83~~22.96 Hedonic regression methods or the option price method can be used to estimate the value of quality changes associated with model replacements to enable the price indexes for ICT goods and goods with IT components to capture their quality improvements. In the case of microprocessors, rather than just considering physical characteristics, performance benchmarks or indicators are sometimes included in the hedonic quality adjustment model. If hedonic and options pricing~~these~~ methods are not feasible, information on the cost of production of a new product feature may be used to adjust the product's price index for the quality change. For example, a new capability of a motor vehicle made possible by embedded semiconductors and software might be valued by the producer's cost of adding this feature plus the usual distribution margins included in the retail price.

2. Software and data

~~22.84~~22.97 Software and data assets play critical roles in the success of many digital firms. The growing importance of software has expanded the range of uncertainty around the deflator for investment in IT products because the volume and quality of different software packages are hard to assess, and in-house production of software is common. The price or volume growth of own-account software and data must generally be inferred from the prices and volumes of the inputs, either assuming no productivity change or using the rate of productivity change of a related activity. Another option for deflating custom software is to use the price index of a related product, such as standardized software products sold by software publishers.

Continuous improvement in the performance of AI software that learns from experience is not included in the volume of software investment.

~~22.85~~22.98 Data is a heterogeneous type of asset, with wide variation in value depending on the topic, context, and circumstances. The volume and value of gross investment in creating data assets are measured by the volume and value of the inputs used to produce the data assets. This could be smaller than the income that the data is expected to generate. If the data is sold, ~~However,~~the price received may imply the need to record a revaluation. ~~holding gains and losses may change the value of the data, and n~~Normal obsolescence causes the volume of a data asset to decay. ~~will have a downward effect on its volume.~~

3. Cloud computing

~~22.86~~22.99 Many of the enterprises that supply cloud computing services offer a ~~large~~great variety of detailed products within the broad categories of IaaS, PaaS, and, especially, SaaS. Thus, the length and complexity of the menu of products is likely to pose a challenge for construction of a price index for cloud computing services. Frequent introductions of new or modified products and improvements to existing products compound the difficulty. However, serviceable deflators for cloud computing services can usually be compiled by selecting ~~However, price data from~~ representative samples of major product~~s variet~~s with relatively standardized~~stable~~ characteristics from each product category and adjusting for quality changes as necessary. ~~can be used to estimate a deflator for cloud computing output.~~

~~22.87~~22.100 Cross-border transactions are another common challenge for estimation of deflators for output and consumption of cloud computing services. International collaboration may be required to overcome the problems of price data availability so that deflators for the consumption of cross-border cloud computing can be compiled. .

4. Internet and telecommunications services

~~22.88~~22.101 The volume~~s~~ of internet and telecommunications services ~~consumed by households~~ have~~s~~ risen rapidly. ~~substantially a~~s households spend more time online and utilize more data~~via broadband and mobile connections,~~ as e-commerce ~~h~~ expands, ~~and consume more digitally delivered content~~data processing moves to the cloud, and telecommuting becomes routine. Data transmission speeds have also improved. Commonly used methods for constructing consumer price indexes and producer price indexes for telecommunications services may, however, fail to capture this volume growth. To measure the change in the cost of purchasing a given volume of internet and telecommunications services accurately, samples of contracts, products and carriers must be kept up to date and prices must be adjusted for quality changes such as improvements in data transmission speeds or improvements in the geographic coverage offered by a mobile telecommunications provider.

~~22.89~~22.102 If the available price indexes for internet and telecommunications services fail to capture the quality improvements that are appropriate to include in the measure of volume growth, an alternative to deflating by a price index is to estimate the volume growth of internet and telecommunications services directly. The~~cis~~ volume index is~~would be~~ constructed from ~~physical~~ quantity indicators such as megabytes of data usage. To minimize the risk of distortion from changes in the composition of the aggregate being measured, the ~~physical volume~~quantity indicators should be defined at a detailed level, and the growth rates of the physical indicators for the various detailed products should be aggregated using expenditure or revenue weights.

5. E-commerce and digital intermediation platforms

22.103 Both business-to-household and business-to-business e-commerce transactions enable producers to access markets they could not otherwise serve, and prices may behave distinctively in the markets accessed through digital channels. The prices used to construct the price index for a type of good or service must therefore adequately represent the e-commerce transactions. Similarly, suppliers that predominantly sell through digital channels, including e-tailers, digital platforms, and sellers/producers dependent on DIPs, must be must adequately represented in the samples of suppliers.

22.104 Deflators for household final consumption expenditures on items sold online must give appropriate weight ~~adequately represent~~ to prices from e-tailers, ~~e-commerce outlets and~~ and other sellers/producers selling online, including those selling through DIPs.~~suppliers, and from suppliers selling on digital platforms, because online prices may have different trends from offline prices. Furthermore, the high frequency of changes in online prices will often make a monthly unit value a more suitable measure of the price of an item in a month from an online supplier than the supplier's price at a point in time during the month. Finally, if item-level data on expenditures are available for the online sellers, the index weights should reflect this expenditure data and an index formula or algorithm that is resistant to chain drift should be used. (Chain drift is the distortion caused by fluctuations in the weights in a chained index.) Online prices from e-commerce retailers~~ Prices from online retailers and ~~and~~ sellers on DIPs~~platforms such as ridesharing and short-term rental platforms drivers~~ are often lower than offline prices for similar~~comparable~~ items. The change in the average price paid by households when households substitute a source of supply with a different price level for their old source of supply for an identical item conceptually represents a decline in the deflator for household final consumption expenditures. In practice, however, practical difficulties and concerns about possible unobserved differences in quality usually keep price index compilers from capturing the possible price decline associated with the switch to online sources of supply.

22.105 A common practice in constructing price indexes for a good or service is to treat the price at a single point in time during the month as the price for the entire month. However, online prices tend to change more frequently than once a month. For items with frequent changes in their online price, a monthly unit value will provide a suitable measure of the price during the month if the data on expenditures and unit sales needed to calculate the unit value are available. When available, item-level expenditure data can also furnish detailed weights for a price index or volume index.

6. Expanded access to variety and customization

~~22.90~~22.106 Digitalization has given buyers access to vast arrays of products available for purchase and to abundant information on products and sellers and ~~The information provided by digital platforms and e-commerce suppliers enables households to locate the detailed varieties whose characteristics best match their tastes and needs from among the vast array of products available for purchase online. Digitalization~~ has also increased opportunities for product customization. This expanded access to variety and information has improved buyers' ability to find ~~the~~ the specific varieties and suppliers whose characteristics best match their needs or tastes. ~~By e~~ The upward effects on the level of material wellbeing achievable with a given level of spending from expanding households' access to variety and improving the matching of product characteristics with ~~the~~ shoppers' tastes and needs are beyond the scope of the deflator for household final consumption expenditures. However, they are relevant for understanding the effects of digitalization on the growth of material wellbeing.

~~or tastes. This has increased~~of the households that consume them, ~~digitalization has improved the efficiency with which output is goods and services are used once it has~~they have been produced. ~~The effective decline in the cost of household final consumption due to the expanded variety and information available to purchasers following digitalization is beyond the production boundary of GDP but could be part of in an an expanded measure of economic activity that considers that the change in households' material well-being or economic welfare linked to digitalization. associated with digitalizatioextended account . Such an expanded measure of economic activity would be presented derived in an extended account. on~~

~~Households' material well-being (or welfare) from consumption of goods and services has therefore grown faster than production of goods and services. This source of welfare gain could be relevant for an extended concept of consumption volume used for analytical purposes. The welfare gains from better use of output once it has been produced are, however, not part of the production that is measured by the national accounts. Similarly, the welfare gains from inventions of new digital products with novel characteristics are beyond the scope of the price and volume measures of the SNA.~~

7. Free digital products

22.9122.107 Conceptually, the increased availability to households of free products brought about by digitalization represents a decline in the price and an increase in the volume of the household final consumption basket. The effect of appearance of a free product is straightforward to measure in the case where the free product directly replaces a priced product. When an item that households must purchase separately becomes free, the same total expenditure will command a greater volume of goods and services and the effect on the household consumption deflator will be given by the decline in the cost of the bundle. However, when the services of free online platforms start to be bundled in the prices of advertised products, the theoretical decline in the cost of the bundle will depend on the assumed value of the free online platform services. An extended account that values the free services of digital platforms by their cost of production is discussed below in the subsection on "Analytical Tools to Increase the Visibility of Digitalization."

22.9222.108 The free digital services and embedded product capabilities in devices such as the smartphone that have appeared since the start of digitalization often enable households to achieve outcomes that previously required purchases of market goods and services. They may also save time or allow their user to do things that they previously could not do. However, the assumptions required to measure the effects on the household final consumption deflator of the appearance of a free digital product that is not a direct replacement for any priced product would often have unacceptable effects on the replicability of the results. Theoretical effects on deflators and volume growth associated with the appearance or disappearance of free digital products that are impossible to measure without hard-to-justify assumptions are beyond the scope of the measures of the national accounts.

F. Analytical Tools to Increase the Visibility of Digitalization

Commented [A20]: This section will not be included in BPM7

22.9322.109 Digitalization is a multidimensional phenomenon that requires multiple indicators and perspectives to understand. Furthermore, the standard national accounts aggregates provide limited information on the transactions, products and activities affected by digitalization. In the standard classification of industries and commodities published in the national accounts, digital products are often subsumed in broader aggregates and scattered across different aggregates. Enhanced visibility into digital firms, products, and transactions is therefore needed for a full understanding of the effects of digitalization on the economy and of the performance and the evolution of a digitalized economy. Distinguishing the digital components of the standard aggregates will also provide reassurance to the users of the national accounts that the output and consumption of digital products is being fully measured as part of those aggregates.

22.9422.110 A thematic account on the digital economy, digital supply and use tables (SUTs), and an extended account on free services of online platforms are flexible tools for bringing the impact of digitalization on the economy into focus, where flexibility means that the content that is appropriate to include depends, in part, on which aspects are locally important and practical to measure. These tools complement each other. The conceptual framework of the digital SUTs will help to ensure the accuracy and consistency of the data presented in the digital economy thematic account, while the digital economy thematic account ~~can help~~is a tool for communicating~~e~~ the key information contained in the digital SUTs in a convenient and accessible way and for providing~~e~~ additional context. Also, an extended account can present an alternative framework for accounting for the unpriced services that free online platforms supply to households. Households' consumption of the free services of digital platforms funded by advertising and the collection of data is a major element of the gains in economic welfare associated with the digital transformation.

1. Thematic Account on the Digital Economy

22.9522.111 ~~A thematic account on the digital economy is a flexible tool for communicating the information needed to understand key aspects of digitalization and its impact on the economy.~~ Compiling a thematic account on the digital economy and the related digital supply and use tables (SUTs) can bring visibility to activities, products and transactions affected by digitalization that are subsumed in broader aggregates in the standard classifications of the national accounts. A digital economy thematic account provides alternative aggregations and additional detail on products and transactions ~~that~~to separately identify~~ies~~ the digital segments of industries, digital products, and digital transactions~~.~~ and can highlight key information from the digital SUTs. The conceptual framework of the digital SUTs helps guide the compilation of the digital

economy thematic account. ~~. The digital supply and use tables (SUTs) may supply much of the data presented in a digital economy thematic account.~~ (For general background on the purpose of thematic accounts and the use of SUTs to compile a thematic account, see chapter 38.)

~~22.96~~22.112 In developing a digital economy thematic account, the items that are most important for understanding the impact of digitalization should be prioritized. These items are likely to include breakouts of digitally ordered and digitally delivered transactions, production and intermediate consumption of cloud computing services and digital intermediation services. They may also include ~~, and~~ the output and value added of ~~each of~~ the industries supplying ICT goods and software, business-to-business and business-to-household e-commerce margin services, and other ~~types of~~ digital services such as cloud computing services, telecommunications and internet services, digital intermediation services, digital advertising services, and digital financial services. ~~ICT services, and other digital services~~. The suppliers of ~~other~~ digital products ~~services~~ ~~may~~ ight be classified into providers of digital infrastructure (digitally enabling industries) ~~into~~ , e-tailers, ~~and~~ data- and advertising-driven platforms, ~~non-financial~~ digital intermediation platforms, financial service providers primarily operating digitally, and other service providers operating only digitally.

~~22.97~~22.113 The thematic account should summarize the uses of ICT goods and digital services, including uses for own-account and purchased investment. The fixed capital formation that enables digital activity is also relevant for understanding the impact of digitalization. In addition to ICT equipment, software, and data, this fixed capital includes the infrastructure of data centers and networks.

~~22.98~~ Trade flows of ICT goods and digital services are important to include in the thematic account on the digital economy. A decomposition of exports and imports by major category of products may also be important to report to show the source of the differences between domestic production and domestic uses of the items in these categories. International transactions that are digitally ordered or digitally delivered are additional aspects that should be highlighted in the thematic account. ~~Furthermore, the share of domestic transactions that are digitally ordered transactions is an important indicator of the penetration of e-commerce that is also appropriate to include.~~

~~22.99~~22.114 The indicators in the digital economy thematic account need not be limited to products within the SNA production boundary. The free services that digital platforms supply to households valued by their cost of production can be reported as an addendum item.

2. Digital Supply and Use Tables

~~22.100~~22.115 The digital supply and use tables (SUTs) analyze the impact of digitalization along the three dimensions of the nature of the transaction (digitally ordered, digitally ~~transmitted~~delivered, or intermediated by a DIP) , products, and industries by adding new detail and aggregations to the standard SUTs. This approach ensures that the framework for analyzing digital transactions, products and industries is aligned with existing classifications and takes advantage of those classifications. The supply table classifications enable a decomposition of the domestic and imported sources of supply of digital products, and the use table classifications enable a decomposition of the uses of digital products for intermediate consumption, final consumption, investment, and exports.

~~22.101~~22.116 As conceptually defined, the digital SUTs have cells that can accommodate all potentially relevant transactions, which makes the number of possible entries in the new rows and columns large. To reduce the compilation burden and source data requirements, a set of high priority aggregates has been identified. The recommended high priority items include (a) decompositions of expenditures by the nature of the transaction, (b) output and intermediate consumption of digital intermediation services, cloud computing services, and ICT goods and digital services, and (c) the output and gross value added of digital industries. (For detailed guidance on compiling digital SUTs, see the *OECD Handbook on Compiling Digital Supply and Use Tables*.)

~~22.102~~22.117 E-commerce transactions are defined by digital ordering~~.~~ using methods specifically designed for the purpose of receiving or placing orders. To provide insight into digitally ordered transactions, the digital supply and use tables include new rows that distinguish these transactions, along with a further decomposition into transactions ordered directly from a counterparty, transactions ordered through a resident digital

intermediation platform, and transactions ordered through a non-resident digital intermediation platform.

22.10322.118 Digital delivery of services is also an important aspect of digitalization. The digitally delivered portion of the output of domestic industries and imports may be shown in "of which" columns in the digital supply table, and digitally delivered portion of household final consumption and exports may be shown in "of which" columns in the digital use table.

22.10422.119 To bring visibility to the output and intermediate consumption of digital products, new rows are added to the SUTs on ICT goods, cloud computing services, digital intermediation services, and all other digital services. An addendum on products beyond the standard production boundary may also have rows for free services of digital platforms and free services of online communities of volunteers. Including imputed values of these free services in the digital SUTs will facilitate compilation of an extended account on free digital services.

22.10522.120 The output and gross value added of digital industries and related industries are shown by incorporating seven new columns in the digital SUTs. One column contains the digitally enabling industry, which comprises the producers of ICT goods and services enabling the use of information technology. The other six columns cover online platforms funded by advertising and data collection, digital intermediation platforms, producers that depend on digital intermediation platforms, e-tailers, financial service providers primarily operating digitally, and other producers operating only digitally.

3. Extended Account to Increase the Visibility of the Free Services of Digital Platforms Consumed by Households

22.10622.121 Free online platforms funded by advertising and collection of users' data have become part of daily life and the time spent by households using platforms offering free services such as social media, search, entertainment, and information suggests that households place a high value on the free services of digital platforms funded by advertising and data collection. An estimate of the value of these free services is therefore relevant for understanding and analyzing the impact of digitalization on the growth of household consumption of goods and services. Yet the value of the free services of platforms funded by advertising and collection of users' data is not estimated as part of compiling the standard sequence of economic accounts because the cost of supplying these services is implicitly included in the price of the advertising services and data sold by the platform and the platform's own-account investment in data assets. In effect, in the standard sequence of economic accounts, the digital platform is itself the user of the free services, and the benefits that households derive from these services are merely a positive externality of the production of advertising services and data assets.

22.10722.122 To provide information on households' direct consumption of the "free" services of digital platforms funded by advertising and data collection, compilation of an extended account showing the value of these services is encouraged. Extended accounts are a flexible tool for presenting concepts that extend SNA boundaries, including expanded measures of economic activity and household final consumption expenditures that extend the production boundary.

22.10822.123 Households' consumption of the free services of advertiser-funded digital platforms can be included in an extended account as part of expanded measures of household final consumption expenditures and output. Although letting these services be consumed twice, once by households as they use the platform and a second time by the platforms as they produce advertising services and data assets, would cause double counting in a measure GDP, expanded measures of economic activity and household consumption that reflect the simultaneous consumption of these services by the households using the platform and by the platform itself are analytically useful .

22.10922.124 In the framework of the extended account, households' consumption of unpriced services produced by the platforms' software and hardware assets in exchange for ~~providing~~granting a license to collect data on their behavior and characteristics (or observable phenomena – (OP) can also be included. The licenses to collect the ~~households'~~ data are viewed as a payment in kind for the platform's unpriced services and the platform's unpriced services are viewed as a payment in kind for the licenses to collect the ~~users'~~ data. However, agreeing to the collection of data on one's OP is not a service, so the platform's imputed payment for the license is a rent rather than a consumption expenditure.

~~22.110~~22.125 The imputed values of items that are bartered for each other (the unpriced platform services consumed by households and the opportunities for the platform to collect the households' data) must be the same. Consequently, there are four theoretical ways to value the platforms' unpriced services: (1) the platform's cost of producing the free services, (2) the value that the households place on the free services, (3) the value that the households place on the privacy of their data that they give up, and (4) the economic benefits that the platforms derive from users' attention and ~~access~~ the opportunity to collect their~~users'~~ data. The need for consistency within the system of measures of the transactions of the free platforms makes the cost of producing the services the most suitable of these four theoretical values for the extended account. Own-account investment in data assets is usually measured by the cost of production approach, so valuing the licenses to collect data on users' OP by the cost producing the platform services exchanged for these licenses would be consistent with the general approach to measurement of own-account investment in data assets. Cost of production is also more practical to estimate than the other three theoretical values of the platform's free services.

22.126 Although the payment in kind from the platform to the households consists of services produced by the platform, the ~~license to~~ access given to the platform collect data on the households' OP that is received in return is not a service produced by the households~~.~~ so ~~and~~ the imputed payment for th~~at~~ license is classified as a rent (see paragraph 22.21? for additional details). Licensing collection of data on one's OP is not a production activity – ~~households' OP are not a produced asset, so access to~~ observing and recording a subject's characteristics and actions ~~households' OP cannot be considered~~does not represent consumption of the services of a produced fixed asset. However, if households actively assist in the collection of their data, the steps they take to assist with the data collection can be considered a production of services (but such cases are rare).

~~22.111~~22.127 The expanded measures of free platforms' output and value added in the extended account will include the imputed value of the free services consumed by households. The balance of primary incomes of the platforms will, however, be unchanged. The platforms' extra value added from imputed sales of services to households will equal the platforms' imputed payments of rent for the licenses to collect households' data. Household saving will also be unchanged because the imputed household consumption expenditures on platform services will equal households' imputed income from licensing collection of their data.

~~22.112~~22.128 In addition to allowing collection of data on their OP, households provide economic benefits to free platforms by creating and supplying user-generated content without monetary compensation. In the standard sequence of accounts, households that receive monetary payments for the content they post online are unincorporated household enterprises producing services, but content supplied without payment is beyond the production boundary. To increase the visibility of households' unremunerated creation of user-generated content, the extended account can treat user-generated content that is uploaded without monetary payment as part of a barter transaction in which the platform user receives unpriced platform services in exchange for the user-generated content. Under this alternative approach, the platform's unpriced services are used by the content creators as inputs to produce the user-generated content and the user-generated content is used by the platform to produce data assets. The net effect is to increase in the measure of the platforms' own-account investment in data assets.