OECD Handbook on Compiling Digital Supply and Use Tables

OECD

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Foreword

Digitalisation has fundamentally altered the production and consumption of goods and services worldwide over the past two decades. The increasing digitalisation of our economies creates challenges for compilers of official economic statistics, who are tasked with ensuring that the digital transformation is both accurately measured and visible.

In response, in 2017 the OECD Committee on Statistics and Statistical Policy established the Informal Advisory Group (IAG) on Measuring GDP in a Digitalised Economy to progress the measurement of digitalisation within economic statistics, particularly in the System of National Accounts. The IAG helped to develop the Digital Supply and Use Tables (Digital SUTs) framework and this handbook.

The Handbook on Compiling Digital SUTs is designed to serve two purposes:

- To define clearly the various concepts used, list the high priority indicators, and set out expectations for compilers and users of Digital SUTs.
- To document and share the work currently being undertaken by national and international organisations to make digitalisation more visible in macroeconomic statistics, helping countries in their efforts to populate the Digital SUTs.

The Handbook on Compiling Digital SUTs reflects the outcome to date of the IAG's efforts. While significant progress has been made in a relatively short space of time, practical implementation of the framework is still in its initial stages. The handbook aims to highlight the importance of consistent definitions and concepts that cover a rapidly evolving phenomenon, while also providing statistical compilers the tools and encouragement to produce more estimates.

The handbook was produced by John Mitchell, Sarah Barahona and Jorrit Zwijnenburg (OECD). It was produced under the auspices of the IAG on Measuring GDP in a Digitalised Economy, chaired by Erich H. Strassner (IMF; formerly United States Bureau of Economic Analysis) and benefitted greatly from discussions at the 2022 and 2023 meetings of the IAG. Drafts were made available to all members of the IAG, many of whom provided useful feedback. Special thanks go to those members that provided specific contributions included within the handbook, including Hussein Charara, Connor Franks, Tina Highfill, Jessica Nicolson (United States BEA); Yvonne Hayden (CSO Ireland); Ziad Ghanem (Statistics Canada); Melker Pettersson Loberg (Statistics Sweden); Nicky Kuijpers, Sjoerd Hooijmaaijers, Joram Vuik (Statistics Netherlands); Brent Moulton, James Tebrake, Martha Tovar (IMF); Daniel Ker (UNCTAD) Luke Michaelides, Daniel Robinson, Cliodhna Taylor (ONS, United Kingdom) and Ina Tobiassen (OECD). Additional thanks go to Antonella Liberatore and David Brackfield (OECD) who assisted in ensuring consistency between the Digital SUT and digital trade frameworks.

The final version of the report was formatted by Chloe Acas (OECD).

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Executive summary

The introduction to this handbook discusses the recent growth of the digital economy, with producers increasingly using digital technology to revolutionise their production processes, and with new business models being created based on the digital transformation. To improve the visibility of digitalisation in macroeconomic statistics, the Digital Supply and Use Tables (SUTs) framework has been developed under the auspices of the Informal Advisory Group (IAG) on Measuring GDP in a Digitalised Economy, a body established by the OECD in 2017. The Digital SUTs framework builds on existing work to measure digitalisation and is consistent with the System of National Accounts (SNA), taking as its starting point the conventional SUTs in the SNA. The proposal to include the Digital SUT framework presented in this handbook as a supplementary table in the 2025 update of the SNA was endorsed by the SNA update process in November 2021.

Framework for digital SUTs

Definitions of the digital economy remain under discussion. The Digital SUTs framework allows for flexibility with regard to definitions and multiple perspectives, reflecting the view of the IAG on Measuring GDP in a Digitalised Economy that the digital economy is a multidimensional phenomenon. The framework aims to generate a range of outputs providing information on different perspectives. Although the starting point for the Digital SUTs is the conventional SUTs, in the Digital SUTs three dimensions are introduced for measuring the digital economy: the nature of the transaction (the “how”), the goods and services produced (the “what”), and the new digital industries (the “who”). These lead to additional rows and columns within the Digital SUTs compared with the conventional SUTs. There is also a selection of high priority indicators that countries are encouraged to compile.

The nature of the transaction (the “how”)

The first dimension of measurement of the digital economy, the nature of the transaction, is a fundamental element of the Digital SUTs framework. As digitalisation has led to a rapid expansion of digital ordering and digital delivery, including for non-digital products, it is increasingly important to identify the digital nature of transactions. Within the Digital SUTs framework, a product can either be digitally ordered or non-digitally ordered, with a further breakdown of digitally ordered into whether it is ordered directly from the counterparty (producer) or via a Digital Intermediation Platform (DIP). This requires clear definitions and a structure for different types of digital ordering and delivery. Consistency with the framework for measuring digital trade is also important, and this handbook refers frequently to the recently updated *Handbook on Measuring Digital Trade*. The discussion covers examples of data sources used by compilers to produce the estimates and the specific challenge of dealing with digitally ordered retail margins.

Digital products (the "what")

The second dimension of the Digital SUTs framework is the product perspective. In the conventional SUTs, digital products may be recorded in many product rows that also include non-digital products. In the Digital SUTs, digital products are aggregated and shown separately in two rows: Information and Communication Technology (ICT) goods and digital services. Estimates for the production and final demand of ICT goods and digital services illustrate how digitalisation is changing production processes and consumption habits. In addition, two products of considerable policy interest are shown separately: cloud computing services (CCS) and digital intermediation services (DIS). Compiling estimates for ICT goods and digital services is relatively straightforward, while for CCS and DIS there are greater challenges. The resulting aggregates of digital products can be shown as proportions of both the supply table (output, imports) and the use table (e.g. household consumption, capital formation, intermediate consumption), providing a comprehensive view of the importance of digital products to the economy.

Digital industries (the "who")

The Digital SUTs identify seven new "digital industries", which are shown in separate columns to give visibility to digital activities that are not visible in the conventional SUTs. These seven new industries are: *The digitally enabling industry; DIPs charging a fee; data- and advertising-driven digital platforms; producers dependent on DIPs; e-tailers; financial service providers predominantly operating digitally; and other producers only operating digitally.* These digital industries reflect how producers utilise digital technologies rather than the fundamental type of economic activity undertaken. Separating out firms and other producers into the new digital industries provides important perspectives on the amount of output, value added, compensation of employees and employment being provided by industries that are reliant on digitalisation. Countries have so far produced estimates for the new digital industries using two different approaches. One attempts to identify specific units and reallocate them to the new digital industries, while the other uses indicators to derive an aggregate estimate of output, intermediate consumption and value added being produced by the new digital industry.

Compiling outputs using templates

In recent years, several countries have produced estimates consistent with the Digital SUTs framework, with early outputs focusing on the agreed high priority indicators:

- Expenditure split by nature of the transaction
- Output and/or intermediate consumption of total ICT goods and digital services, CCS and DIS
- Digital industries' output, gross value added and its components

The Digital SUTs framework includes recommended templates for the outputs, which are included in this handbook. These templates will help countries to produce outputs in a consistent manner, improving the visibility of digital activity within their national accounts while also enabling their results to be compared with those of other countries. Initial outputs consistent with the Digital SUT framework have already been created by several countries. The non-prescriptive nature of the Digital SUTs framework (where estimates can be published if the data is available but compilers can choose not to publish results for which they lack data or have quality concerns) will help countries to make progress and publish results, even if they are "experimental".

1 Overview

A Digital Supply and Use Tables (SUTs) framework consistent with the System of National Accounts (SNA) is needed to improve the visibility of digitalisation in macroeconomic statistics. This chapter discusses the recent growth of the digital economy, existing work to measure digitalisation, and the proposal to include Digital SUTs in the 2025 update of the SNA.

The purpose of the handbook

This handbook and the Digital Supply and Use Tables (Digital SUTs) framework it advocates have been created to respond to demand for more information on the impact of digitalisation on the economy, and how this may be represented in the System of National Accounts (SNA). The handbook has been developed under the auspices of the Informal Advisory Group (IAG) on Measuring GDP in a Digitalised Economy, a body established by the OECD Committee on Statistics and Statistical Policy in 2017 to progress the digitalisation measurement agenda.

The handbook serves two broad purposes:

- To define clearly the various concepts used, list the high priority indicators, and set out expectations for compilers and users of Digital SUTs.
- To document and share the work currently being undertaken by national and international organisations to make digitalisation more visible in macroeconomic statistics. This work will assist countries in their efforts to populate the Digital SUTs (OECD, 2016[1]).

Compilation of the Digital SUTs is still in its infancy and the handbook, like the Digital SUT framework, is not a finished product. The handbook is intended to be kept updated to maintain its relevance and keep abreast of the most recent developments in the compilation of the Digital SUTs. It has not been written solely as a reference tool, but also as a way of highlighting this important work and encouraging efforts to improve data collection and compilation practices associated with the framework.

The need for the Digital SUTs framework

Digitalisation has fundamentally altered the production and consumption of goods and services worldwide. Firms have been able to leverage digitalisation in order to disrupt established markets and improve the efficiency of their production processes. At the same time, digital transformation has permitted consumers to access a larger variety of goods and services, while exercising greater control over the characteristics of the transaction processes.[1]

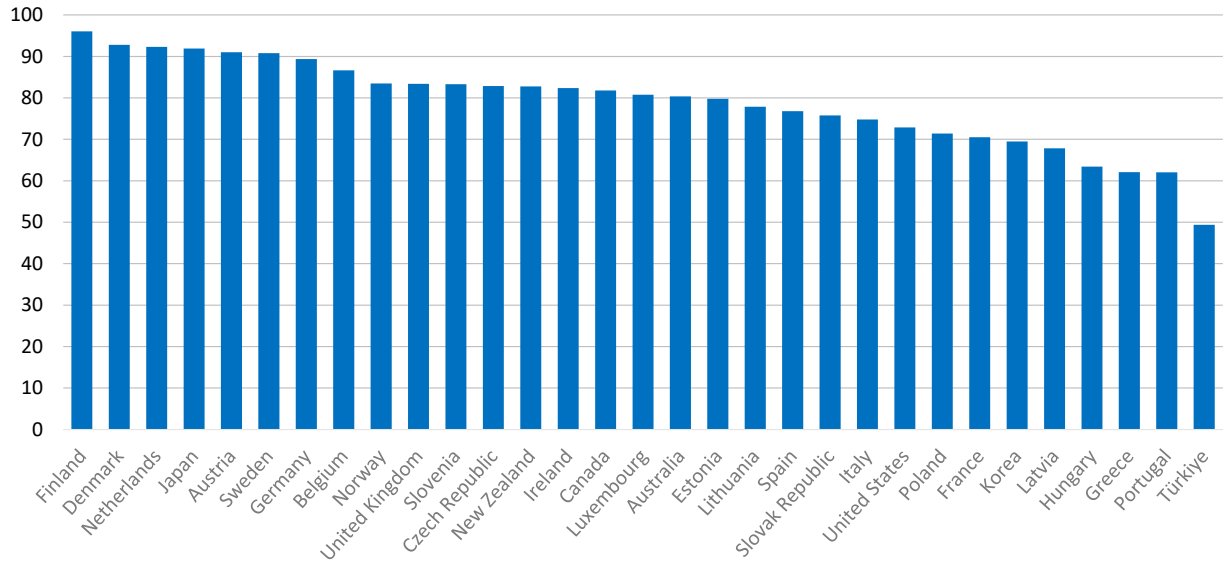
The increasing impact of digitalisation on the economy can be seen, for example, in the automation of tasks previously done by humans and the growing reliance on digital tools to communicate and carry out professional work. The growth of digitalisation of the production and consumption of goods and services is visible when looking at indicators such as the percentage of businesses with a presence on the internet, and the percentage of consumers using the internet to make purchases.

The high proportion of firms within OECD countries with a web presence provides clear evidence that a digital presence has now become a fundamental requirement for most businesses. Importantly, the percentages shown in Figure 1.1 include all (non-micro) businesses with a web presence, regardless of industry or business activity. This demonstrates that this requirement is not only for new firms or “digital natives” for whom digital interaction is fundamental to their business model, but rather, for all firms, including those that now use digitalisation to enhance existing business models.

[1] The terms “digitisation”, “digitalisation” and “digital transformation” may sometimes appear to be used interchangeably, however they each represent something slightly different to each other. “Digitisation” is the conversion of analogue data and processes into a machine-readable format. “Digitalisation” is the use of digital technologies and data as well as interconnections that result in new activities or changes to existing activities. “Digital transformation” refers to the economic and societal effects of digitisation and digitalisation (OECD, 2019[124]).

Figure 1.1. Proportion of businesses with a web presence, OECD countries

% of businesses, 2021 or latest year

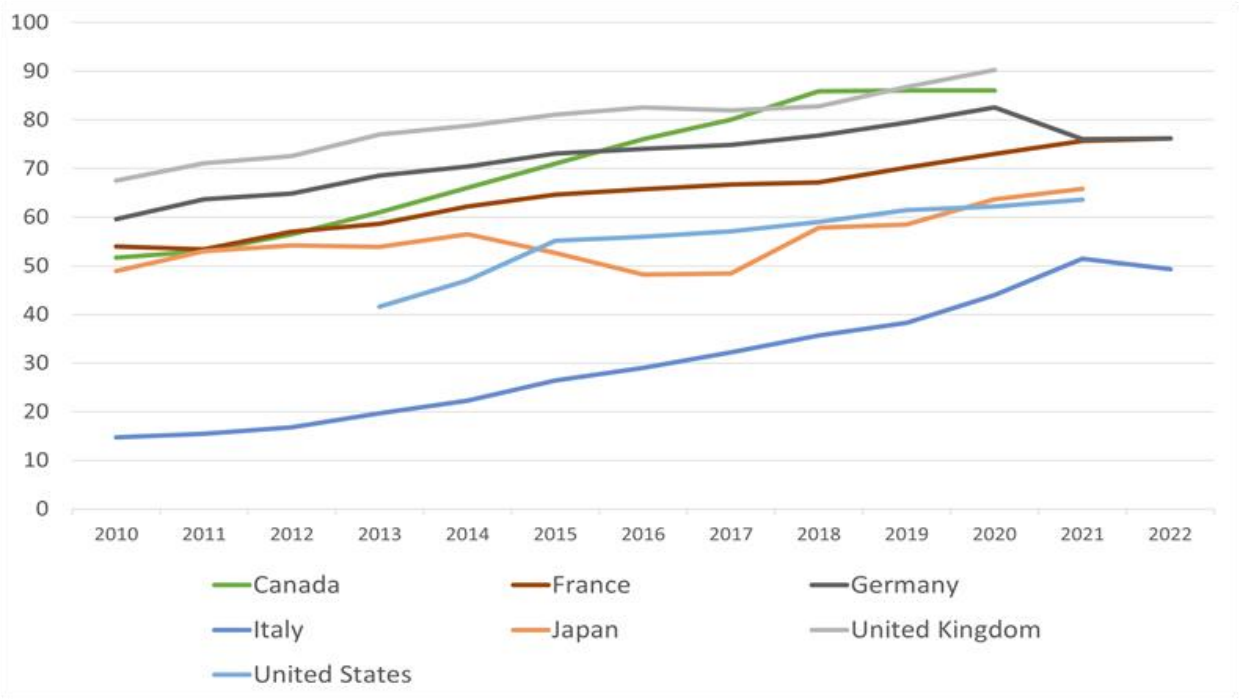


Note: All business (10 employees or more).
Source: (OECD, 2022[2]) OECD Going Digital Toolkit, based on United Nations Conference on Trade and Development (UNCTAD) core indicators on Information and Communication Technology (ICT) use by business and the OECD ICT Access and Usage by Businesses Database, http://oe.cd/bus.

The increasing impact of digitalisation on consumers is also clear; one example is purchasing goods and services online. The percentage of consumers making e-commerce purchases has grown significantly since 2010, increasing by 42 percentage points in Canada and 22 percentage points in the United States (see Figure 1.2). In the United Kingdom in 2020, 90% of people aged 16 to 74 purchased something online.

Figure 1.2. Proportion of internet users who have made e-commerce purchases, G7 countries

% of users, 2010 to 2022



Note: An e-commerce purchase describes the purchase of goods or services conducted over computer networks by methods specifically designed for the purpose of receiving or placing orders.
Source: (OECD, 2022[2]) OECD Going Digital Toolkit, based on OECD ICT Access and Usage by Households and Individuals Database, http://oe.cd/hhind.

The production of businesses with a web presence and the value of the e-commerce purchases are included within countries' national accounts, which are compiled according to the international standards of the 2008 System of National Accounts (SNA). However, their explicit impacts are not visible in the conventional accounts produced by countries.

To improve the visibility of digitalisation in macroeconomic statistics, the Digital SUT framework was developed. The framework, which will be explained in detail in Chapter 2, supplements the conventional Supply and Use Tables (SUTs) of the 2008 SNA by delineating product rows based on the nature of the transaction: digitally ordered / digitally ordered via intermediation platform / not digitally ordered; and by adding columns to reflect the proportion digitally delivered. In addition, Information and Communication Technology (ICT) products are aggregated to provide a simpler representation of firms' and consumers' increasing reliance on these products. Two specific products, digital intermediation services and cloud computing services, are separately identified due to their fundamental importance to the digital economy. Finally, by classifying firms to seven new "digital industries" based on the extent to which their businesses depend on digitalisation, it is possible to produce estimates of output, value added or even employment of digital industries.

The absence of key trends associated with digitalisation within the national accounts has sometimes caused confusion about what is (and is not) included in the production boundary of the national accounts[2]

[2] The production boundary of the national accounts includes "all production actually destined for the market, whether for sale or barter. It also includes all goods or services provided free to individual households or collectively to the

and who is (or is not) benefiting from digitalisation. For example, Coyle (2017, 2018) and others[3] have suggested that GDP may be understated because digitalisation is not being appropriately recorded in the national accounts. Conversely, others[4] have argued that the challenges caused by digitalisation are not a new or unique measurement concern, and mismeasurement, if any, is minor. While the discussion on (mis)measurement focuses on a range of issues, not all of which will be solved by the construction of the Digital SUTs,[5] it is clear that additional information and statistics on the size and influence of digital activity would be beneficial for users. The IMF summed up the sentiment in a 2018 report on the digital economy: "Data users need more extensive and more granular statistics on the scale and structure of the digital activity to understand economic developments in a digitalised economy" (IMF, 2018[3]).

This need for more information has been picked up by other international groups such as the G20 Digital Economy Task Force (DETF), which in 2018, 2020 and 2021 requested a greater focus on measuring digitalisation and its impact on the economy. The task force called for the development of satellite accounts focusing on the digital economy (G20 DETF, 2018[4]). It also advocated the *G20 Roadmap toward a Common Framework for Measuring the Digital Economy* including Digital SUTs as a means to improve the visibility of digitalisation in the national accounts (G20 DETF, 2020[5]), (OECD, 2020[6]). Finally, it emphasised the need for co-operation and sharing of best practices amongst national statistical offices to delineate and improve the integration of the digital economy in macroeconomic statistics (G20 DETF, 2021[7]).

This handbook attempts to achieve both of the aims laid out by the G20 DETF:

- to clearly outline a framework whereby meaningful indicators of digital activity can be produced consistent with the national accounts, and
- to provide an outlet where methods and statistical approaches can be shared in order to improve capability across the statistical community.

Meeting the needs of policy makers is, of course, central to the design of new statistics and statistical standards. Therefore, this handbook is designed both to address concerns about mismeasurement, which might cast doubt on the reliability of the accounts, and also, more generally, to increase the usefulness of the national accounts for policy making purposes.

community by government units or NPISHs" (2008 SNA §1.40; (UNSD, Eurostat, IMF, OECD, World Bank, 2009[18]). What is not included is goods or services provided free by private enterprise. NPISHs = non-profit institutions serving households.

[3] There is a range of documents that have addressed the impact of digitalisation on the measurement of GDP, ranging from concern regarding the increasing wedge between GDP and consumer surplus (Brynjolfsson and Collis, 2019[120]) to concluding that current GDP estimates are understated (Feldstein, 2017[119]).

[4] Papers that have suggested that mismeasurement is not cause of the productivity slowdown include (Aeberhardt et al., 2020[123]) (Ahmad, Ribarsky and Reinsdorf, 2017[125]) (Ahmad and Schreyer, 2016[122]) and (Byrne, Fernald and Reinsdorf, 2016[121]).

[5] Concerns regarding the impact of digitalisation on GDP can normally be placed into one of three categories; (i) whether the conceptual boundary of GDP should be altered to reflect behavioural changes brought in by digitalisation, (ii) whether the prices of new and improved digital products are being accurately measured, (iii) whether the output of new digital services are being appropriately incorporated. The Digital SUTs will assist in addressing (ii) and (iii).

Existing work to measure digitalisation and how this relates to the Digital SUTs

An absence of frameworks or a definitive definition of the digital economy has meant that work has been undertaken on a relatively ad hoc basis, with different countries using different definitions and methodology for generating estimates of the digital economy.[6] The United States (Barefoot et al., 2018[8]), Canada (Statistics Canada, 2019[9]) and Australia (Australian Bureau of Statistics, 2019[10]) have all published estimates of the digital economy. These estimates were created by identifying certain products as "digital" and then calculating the value added associated with the production of these products. This has the benefit of producing replicable estimates consistent with the national accounts. However, by simply grouping products, they struggle to capture the full impact of digitalisation on the economy, including ordering and delivery of non-digital products via digital channels.

Conversely, estimates that focus solely on e-commerce and the amount of consumption taking place via digital channels (including digital intermediation platforms) may overlook the important impact that ICT goods and services are having on the production of digital and non-digital products. Some publications have tried to be more comprehensive. For example, one estimate of the digital economy for China combined production contributing to digital outputs and "value added and employment generated through the use of digital technology in sectors other than ICT" (Miura, 2018[11]). The resulting estimate was a much higher proportion of GDP than those discussed above for the US, Canada and Australia.

The Informal Advisory Group on Measuring GDP in a Digitalised Economy sees the digital economy as a multidimensional phenomenon. It acknowledges that compilers in national statistical offices, policy makers and other users hold different views on any single definition of the digital economy and resulting estimates such as total output, value added or employment of the digital economy. This handbook does not advocate a single definition of the digital economy, but instead presents a Digital SUT framework that aims to provide different perspectives on how digitalisation affects the economy.

By adopting this approach, the Digital SUTs can produce a suite of indicators on different aspects of digital activity in the economy. These include the value of products ordered or delivered digitally, the importance of digital products to firms during production, and the output and value added of specific types of producer that are significantly impacted by or completely reliant on digital technology. Chapter 2 provides further details.

At the same time as the development of the framework for the Digital SUTs, there has been work taking place on improving the measurement of digital trade. The first edition of the Handbook on Measuring Digital Trade, published in 2020, outlined the basic digital trade framework (OECD, WTO and IMF, 2020[12]). This has now been revised and updated (IMF, OECD, UNCTAD, WTO, 2023[13]) in close coordination with the work on the Digital SUT handbook. Importantly, the approach to digital trade measurement and the framework for the Digital SUTs are both centred around delineating transactions based on the nature of the transaction, so estimates of digitally ordered and delivered imports and exports produced for digital trade tables should provide useful inputs for the Digital SUTs.

[6] For a full discussion on different definitions of the digital economy, see (OECD, 2020[6]) which build on the work of (Bukht and Heeks, 2017[26]).

The use of Digital SUTs in the updated SNA

The development of a Digital SUT framework consistent with the SNA and compilation by countries was first suggested by the OECD IAG on Measuring GDP in a Digitalised Economy, which was set up in 2017. The main objective of the group was to "advance the digitalisation measurement agenda" while at the same time, serving as "a forum and focal point to share ideas and experiences; and to develop best practice".[7]

Digitalisation was also picked up as a key research topic within the formal revision process of the 2008 SNA coordinated by the Inter Secretariat Working Group on National Accounts (ISWGNA) and Advisory Expert Group on National Accounts (AEG)[8] (ISWGNA, 2020[14]). The Digital SUT framework, developed by the IAG on Measuring GDP in a Digitalised Economy, was put forward as a possible solution to this challenge. A formal Guidance Note, *DZ.5 Increasing the Visibility of Digitalisation in Economic Statistics Through the Development of Digital Supply-Use Tables,* was prepared and a Global Consultation with (mainly) national statistical offices was undertaken. The Guidance Note was endorsed at the 17th meeting of the Advisory Expert Group on National accounts in November 2021 (ISWGNA, 2021[15]). It recommends that the framework be included as a supplementary table in the update of the SNA, to be published in 2025 (ISWGNA, 2021[16]).

The Global Consultation provided strong support for the Digital SUT framework with a majority of respondents considering the compilation of Digital SUTs as "very relevant" or "somewhat relevant" for their country. Furthermore, around two-thirds of respondents indicated an intention to compile Digital SUTs in the next three to five years. However, a majority also indicated that they would need help with capacity building, methodological or practical guidance (ISWGNA, 2021[17]). Such feedback, which came from all regions of the world, strengthened the case for a handbook to provide examples of how Digital SUTs can be compiled.

As with many changes incorporated into the 2025 update of the SNA, there will be a need for complementary information such as guidelines, handbooks on methodology and material from expert groups and task forces to support production of the new or revised estimates outlined in the SNA. This handbook is one such output.

Digital SUTs as a foundation for digital economy satellite (thematic) account

The Digital SUT framework includes rows for products that are not within the 2008 SNA production and asset boundary and are not expected to be included in the 2025 SNA. These include the consumption of free digital services created by private corporations and communities.

In the Digital SUTs, the values in these rows may be added to the totals recorded in the conventional SUTs. Their inclusion also provides a basis for the compilation of a Digital Economy Satellite Account (DESA). Satellite accounts (or thematic accounts as they will be called in the updated SNA) are a fundamental component of the SNA. They may use different production and asset boundaries to those of the central framework (also known as "core accounts") in order to "make apparent and to describe in more depth aspects that are hidden in the accounts of the central framework" §2.166 (UNSD, Eurostat, IMF, OECD, World Bank, 2009[18]). Possible outputs that might be included in a DESA are labour or occupation

[7] Creation of the advisory group as well as the terms of reference are outlined in the following document. https://one.oecd.org/document/STD/CSSP(2016)16/en/pdf.

[8] The ISWGNA is a multi-organisation body that provides strategic vision, direction and coordination for the methodological development and implementation of the SNA. The AEG is made up of national account experts whose task is to support the ISWGNA in its work.

indicators for the new “digital industries”, the value of “free” digital services provided in exchange for access to personal information, the value of data assets held by firms, or the amount of time consumers spend using digital platforms.

As it is an extension of the core national accounts tables, measurement in a DESA can go beyond that used for the basic accounts and include methods that may differ from the core principles of the SNA. For example, several researchers have produced studies on values associated with the consumption of certain free digital services (Brynjolfsson, Eggers and Gannamaneni, 2018[19]) (Brynjolfsson et al., 2019[20]) (Coyle and Nguyen, 2020[21]). These valuations are not at market value and the interaction they describe is not considered an economic flow from the perspective of the SNA; but the value that consumers assign to these services, some of which they previously may have had to pay for, is of high analytical interest to users. Therefore, national statistical offices may wish to produce a satellite (thematic) account that incorporates such values. The non-prescriptive nature of a DESA would allow countries to focus on specific topics that are of importance to them and measure them in a way that the available data allows.

The structure of the handbook

It is important to stress that this handbook has been prepared to encourage and assist countries to compile estimates consistent with the Digital SUT framework. It does not pretend to be the final and definitive voice on the subject. International compilation of the Digital SUTs is still in its infancy, with only a few countries having already compiled estimates. Therefore, many of the examples in the handbook are “work in progress”. This is particularly relevant for Chapters 3 to 6, which discuss indicators that may be used to complement the conventional Supply and Use estimates published by countries. Even the components of the framework are not set in stone. Improvements may be made following lessons learned during their implementation.

The handbook is set out as follows.

Chapter 2 outlines the framework. It explains the additional rows and columns within the Digital SUTs compared to the conventional SUTs. It describes how certain outputs not only have high analytical value but are also easier for compilers to produce and therefore more likely to be targeted first during the compilation process.

Chapters 3 to 6 cover in more detail the different transactions, discuss how the various digital products are represented in the framework and describe the new digital industries. It also contains examples of how countries collect relevant information, as well as how this data can be used as indicators in the construction of the Digital SUTs. Specifically:

- Chapter 3 focuses on the nature of the transaction (based on ordering and delivery of products), and how this is shown in the Digital SUTs.
- Chapter 4 focuses on digital products, both those that are aggregated to provide a simple metric of digitalisation in the production process and those that are shown separately.
- Chapter 5 focuses on the digital industries that are to be shown separately in the Digital SUTs.

Chapter 6 discusses how some countries have combined the information in the indicators with conventional SUT estimates to create new Digital SUT outputs. It also introduces the templates that countries can use to produce consistent estimates of high priority indicators.

2 Framework for digital SUTs

As the digital economy is a multidimensional phenomenon, any framework for measuring it requires multiple perspectives. This chapter outlines the transition from conventional Supply and Use Tables (SUTs) to Digital SUTs, with three dimensions for measuring the digital economy: the nature of the transaction, the goods and services produced and the new digital industries. The chapter also presents the high priority indicators that countries are encouraged to compile using the Digital SUTs.

The basic framework

Fundamental concepts

Many publications present estimates of how digitalisation is affecting the economy. These include a few that are consistent with the System of National Accounts (SNA), and some of these were discussed in Chapter 1. However, a framework that can bring some of these estimates together in a consistent and internally comparable way has so far been absent.

This chapter describes in more detail the framework behind the Digital Supply and Use Tables (Digital SUTs) including the terminology and definitions of the framework. It is important to emphasise that the terminology and definitions proposed in this handbook and other complementary documents are intended for statistical measurement purposes. While the framework attempts to maintain consistency with the terminology and definitions used in other digital economy contexts, some differences are required in order to align with the conventional SUTs, which the Digital SUTs are based on.

The SUTs within the SNA are different from the standard accounts in that they are a "global table" (Lequiller and Blades, 2014[22]). This refers to the fact that they show the supply (production or import) and use (consumption, investment or export) of every group of products in the economy. Furthermore, the tables are split via industrial activity classification, therefore ensuring that "everything made by someone, is used by someone else" (Lequiller and Blades, 2014[22]).

The SUTs are a good starting point for increasing the visibility of digitalisation in the economy because:

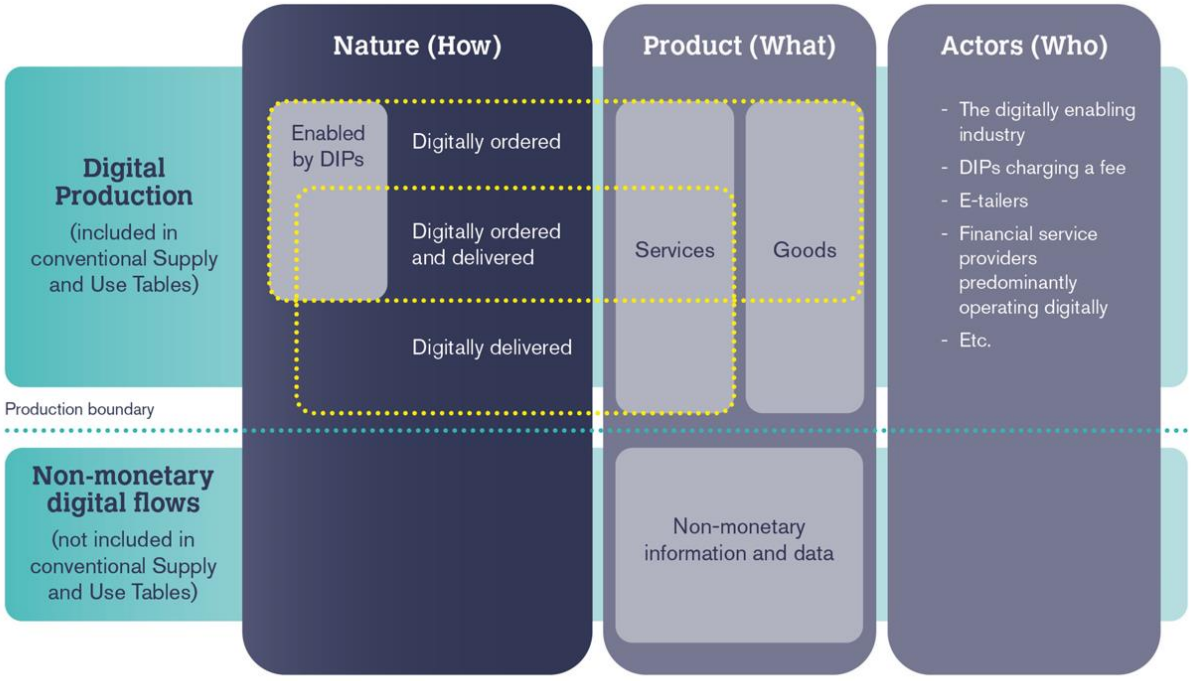
- **Comprehensiveness.** As all production is recorded in the SUTs, the estimates of output, value added, consumption, etc. already include the components that (within the Digital SUTs) should be broken down based on the nature of transaction or on the basis of the unit that produced it. Therefore, the task is one of re-allocation rather than estimation.
- **Broad availability.** As outlined in the 2008 SNA, the SUTs provide "a powerful tool with which to compare and contrast data from various sources and improve the coherence of the economic information system." (§14.3) (UNSD, Eurostat, IMF, OECD, World Bank, 2009[18]). Most developed countries produce SUTs on a regular basis as part of their existing national accounts releases. These are often undertaken as part of the compilation of annual estimates of GDP or as part of a semi-regular benchmarking exercise.
- **Consistency across counties.** The industries and products are based on the internationally agreed industrial activity and product classifications, the International Standard Industrial Classification (ISIC) and Central Product Classification (CPC), with some regional variations.[9] Therefore, a SUT database that is consistent across countries can be produced, and such a database is provided by the OECD.
- **Multidimensionality.** As mentioned in Chapter 1, the digital economy is a multidimensional phenomenon. Thus, any framework tasked with measuring it requires multiple perspectives. The SUTs capture all facets of the economy by requiring that all supply is accounted for (as either domestic production or imports) and that it matches demand (domestic consumption and

[9] The exact classifications used in reach region vary, for instance within the industrial activity classification there are: the statistical Classification of Economic Activities in the European Community (NACE), the North American Industry Classification System (NAICS) and the Australian and New Zealand Standard Industrial Classification (ANZIC). For products, there are: the Classification of Products by Activity (CPA) used in Europe and the North American Product Classification System (NAPCS). However, these activity and product classifications are all based on the standard industrial and product classifications, ISIC and CPC.

investment plus exports). Not only does this ensure that all production is accounted for, but it also provides both an industry and product perspective on the supply and use of goods and services.

The framework of the Digital SUTs is shown in Figure 2.1. The fundamental point of delineation in the framework is the nature of the transaction (the "how"). However, in order to provide outputs that respond to policy questions, additional variables are included: the product being ordered and delivered (the "what"); and some new digital industries (the "who"). Figure 2.1 also clarifies which interactions/transactions are within the SNA production boundary (shown by a dotted line separating digital production from non-monetary digital flows).

Figure 2.1. Proposed framework of Digital SUTs



1. DIPs = Digital Intermediation Platforms.
2. There are currently seven new digital industries; the last column in Figure 2.1. shows examples. The full list is provided later in the chapter.

Source: (IMF, OECD, UNCTAD, WTO, 2023[13]) adapted.

Box 2.1. Defining the digital economy

A question that is often asked when it comes to measuring digitalisation of the economy is how to define the digital economy. Despite many attempts by academics, international organisations and national statistical offices, there is currently no single, generally accepted definition of what the digital economy entails. This absence of agreement could be attributed to the multidimensional nature of the digital economy. Since digitalisation has affected the production, ordering, delivery, and consumption of all most all goods and services, the delineation of the digital economy could be considered almost the same as most modern economies. Even GDP, the most well-known economic indicator produced by the national accounts, still provokes discussion regarding what is to be included and excluded, seventy years after its creation (Coyle, 2014[23]). Most historical definitions of the digital economy have focused on the characteristics that differentiate the digital economy from the rest of the economy;[10] but, while helpful for policy analysis, these definitions may not be helpful for measurement purposes.

A recent OECD publication, prepared for the G20 Digital Economy Task Force (DETF) (OECD, 2020[6]) outlined the two common approaches to defining and measuring the digital economy. The first, a "bottom up" approach, considers the digital economy as limited to a finite set of economic activities that produce specific Information and Communication Technology (ICT) goods and digital services, which facilitate the digitalisation of the economy. This contrasts to the alternative (and broader) "top down" or "trend-based" view, in which the digital economy includes economic activity enabled by the use of ICT goods and digital services, reflecting the trend of digitalisation across the economy.

The digital economy can also be measured by aggregating certain products or industries, seen as representing digitalisation. Evidence of this approach was the classification and definition of the ICT sector in the ISIC Revision 4 (UNSD, 2008[24]) and the complementary list of ICT products in the CPC (UNSD, 2015[25]). These classifications are now widely used internationally. From a policy point of view however, these definitions are often considered too narrow because they miss the impact of digitalisation on the production of traditional goods and services. While growth in these newly formed industries have usually been higher than economic growth, it is likely that the output of these "narrow" interpretations of the digital economy understates the overall impact of digitalisation on the economy.

A recent attempt to merge these two approaches was the definition acknowledged in the 2020 G20 DETF ministerial declaration. This defined the digital economy as "all economic activity reliant on, or significantly enhanced by the use of digital inputs, including digital technologies, digital infrastructure, digital services, and data; it refers to all producers and consumers, including government, that are utilising these digital inputs in their economic activities" (G20 DETF, 2020[5]). Building on previous work by Bukht and Heeks (2017[26]), this was accompanied by a tiered definitional framework, which further delineated the impacts of digitalisation on the economy. These tiers, that are consistent with outputs from the Digital SUTs, separate economic units into firms that produce ICT goods and services (the *digitally enabling industry*), firms that are reliant on these digital inputs (other new digital industries), and finally firms that are enhanced by the use of digital inputs (the remaining industries).

The question of how best to define the digital economy prompted early discussions among those interested in developing a Digital SUTs framework about the need to avoid the issue of what should be included or excluded and focus instead on gaining a better understanding of how digitalisation impacts the economic transactions being measured. The Digital SUTs provide countries with some flexibility on the choice of definition, while also implying that increasing the visibility of digital transactions (and of the products and new digital industries involved in them) is a more achievable outcome in the short term than reaching an international agreement on a statistically implementable definition.

Source: Adapted from (Mitchell, 2021[27]).

Differences between digital and conventional SUTs

The multidimensional nature of the digital economy requires a framework that can produce outputs reflecting the production and consumption of digital products as well as the production and consumption of non-digital products which are obtained through digital means, whether digitally ordered, digitally delivered or both. The SUTs are uniquely positioned to do this: they record not just what was produced and consumed but also who produced and consumed it. Moreover, additional products and industries can be added in order to provide more detail on specific topics, without disrupting the balance within the tables: output, value added and other components are simply moved between rows and columns as required.

The Digital SUTs contain the following additions to the conventional SUTs:

- Six additional rows under each product (and total), separating transactions by whether they are: *digitally ordered* or *not digitally ordered*, with digitally ordered transactions further broken down into *ordered directly from the counterparty* or *ordered via a digital intermediation platform (DIP)*, with a final breakdown splitting the products ordered via DIPs between *resident* and *non-resident platforms*.
- Two additional columns showing the nature of the delivery of the service as either *digitally delivered* or *not digitally delivered*.
- Four additional rows, representing two digital products of particular interest: digital intermediation services (DIS) and cloud computing services (CCS), as well as total Information and Communication Technology (ICT) goods and digital services that fall within the SNA production boundary.
- Three additional rows, representing data and digital service products that are currently outside the SNA production boundary.
- Seven additional columns for new digital industries that are considered worthwhile to show separately. The producers within these industries are aggregated based on characteristics related to the nature of the transaction or how they are leveraging digitalisation.

These additions are important. However, as will be emphasised throughout this handbook, in the initial stages of compilation it is not expected that countries will create estimates for all of them.

Later in this chapter, a set of high priority indicators will be presented. These indicators have been identified by the Informal Advisory Group on Measuring GDP in a Digitalised Economy (the body which has coordinated the development of this handbook, see Chapter 1). They represent a more attainable set of outputs that countries may aim for. In the experimental Digital SUT estimates already published by some countries, the focus has been on digital ordering and delivery related to aggregate estimates rather than a transaction breakdown for each product.

The three dimensions of the framework

The three basic dimensions of the Digital SUTs framework are:

- The nature of the transaction (the “how”).
- The goods and services produced (the “what”).
- The new digital industries shown separately in the Digital SUTs (the “who”).

[10] Bukht and Heeks (2017[26]) provides an extensive guide to various definitions of the digital economy from 1996 to 2017.

The following sections outline the definitions and concepts that underpin these three dimensions. Each dimension is further elaborated in later chapters, which provide examples of how countries are generating indicators in order to produce outputs in the Digital SUTs related to each of them.

The nature of the transaction (the "how")

The nature of transaction is a fundamental element of the Digital SUTs. Conventional SUTs make no distinction on how a transaction is facilitated, focusing only on what product was produced and which industry produced it. Since digitalisation has allowed for such a large expansion of digital ordering and digital delivery, including for decidedly "non-digital" products such as burgers and chips, it is increasingly important to identify the digital nature of transactions.

Nature of ordering

A product can either be:

- (A) digitally ordered, or
- (B) non-digitally ordered.

For a digitally ordered product (A), a further breakdown is made into whether it is ordered:

- (A_i) directly from the counterparty (producer), or
- (A_ii) via a DIP.

With a final breakdown of products ordered via DIPs depending on if the product is ordered:

- (A_ii_1) via a resident DIP, or
- (A_ii_2) via a non-resident DIP.

Table 2.1 presents an example for the product row accommodation services. Theoretically, such a breakdown is conceivable for each product in the SUTs, but it is unlikely that such a breakdown will be compiled at such a detailed level for all products.

Table 2.1. Transaction types in Digital SUTs: accommodation services example

Accommodation services	
A	Digitally ordered
A_i	Direct from a counterparty
A_ii	Via a DIP
A_ii_1	Via a resident DIP
A_ii_2	Via a non-resident DIP
B	Not digitally ordered

Source: The authors.

Although shown for only a single product (accommodation services) in Table 2.1, the additional transaction breakdown is also applied to the rows displaying the total (or aggregate) of all products that are standard in conventional SUTs. The addition of the breakdowns at this level means that higher-level totals of digitally ordered (and non-digitally ordered) products can be produced for all the columns in both the Supply tables and the Use tables. However, as outlined later in the chapter, digitally ordered estimates of total exports, total imports and total household consumption are the highest priority.

Products that are digitally ordered

Transactions in digitally ordered goods and services (e-commerce) are defined in this handbook in the same way as in the Handbook on Measuring Digital Trade (IMF, OECD, UNCTAD, WTO, 2023[13]). In both cases, the definition is consistent with the definition first put forward by the OECD in 2011 in the Guide to Measuring the Information Society:

> *"An e-commerce transaction is the sale or purchase of a good or service, conducted over computer networks by methods specifically designed for the purpose of receiving or placing orders. The goods or services are ordered by those methods, but the payment and ultimate delivery of the goods or services do not have to be conducted online. An e-commerce transaction can be between enterprises, households, individuals, governments, and other public or private organizations. To be included are orders made over the web, extranet or electronic data interchange. To be excluded are orders made by phone, fax or manually typed email." (OECD, 2011[28]).*

Digitally ordered transactions – row (A) in Table 2.1 – are split into those where the product is purchased directly from the counterparty (the producer of the goods or services) and those that are made via a digital intermediation platform (DIP). DIPs are digital platforms designed for the purpose of receiving or placing orders. They produce an intermediation service product.

To differentiate between a transaction via a DIP and one that is direct with the counterparty (producer), it is necessary to know whether the firm facilitating the sale has any ownership of the product being sold. DIPs do not take any economic ownership of the goods and services. They are generating revenue simply by facilitating the transaction between the producer and the consumer. The evolution of DIPs and their involvement in the economy is a key example of the rise of digitalisation and a subject of significant policy interest. Further discussion on DIPs is included in Chapter 5, including their definition, how they are classified and how transactions involving them are recorded in the accounts.

Products that are not digitally ordered

Non-digitally ordered goods and services – row (B) in Table 2.1 – are also part of the breakdowns shown in Digital SUTs. This row is likely to be populated as a residual, that is, output from the conventional SUTs will be considered as non-digital by default until moved to "digitally ordered". If an item is ordered physically or via other non-digital means, such as via the phone or email, it is included in this row even if it is purchased using an electronic payment method.

There is no further breakdown under the "not digitally ordered" transaction row because all products that are non-digitally ordered are, by definition, ordered directly from the counterparty (producer) rather than via a DIP.

Nature of delivery

Products can also be delivered to the consumer digitally or non-digitally. Digitally delivered is defined as *"transactions that are delivered remotely over computer networks"*[11]. This definition is consistent with that used for defining digital trade and includes the delivery of digital services, such as telecommunications, software and cloud computing, as well as the digital delivery of some non-digital services such as education and gambling.

[11] This is a variation on the definition used in the Handbook on Measuring Digital Trade (IMF, OECD, UNCTAD, WTO, 2023[13]). The original is "*All international trade transactions that are delivered remotely over computer networks*." While the amounts represented in the Digital SUTs include cross-border transactions, they also include deliveries made domestically.

Unlike ordering, which is reflected as breakdowns of the product rows, the nature of the delivery is represented as breakdowns of the columns for total output, total imports, total exports, and total household consumption, including "of which" items on the nature of delivery. Such a representation is observed in the Digital supply table produced by Statistics Canada (see Table 2.2). The inclusion of import and exports provides a direct link to the digital trade estimates consistent with the framework in the Handbook on Measuring Digital Trade (IMF, OECD, UNCTAD, WTO, 2023[13]).

Table 2.2. Digital supply table: product totals, Canada, 2019

Million Canadian dollars

	Output, all digital industries	Output, all digital industries- **digitally delivered**	Total output	Total output, industries- **digitally delivered**	Total imports	Imports, digitally delivered	Taxes on products	Total supply at purchasers' prices	Total supply at purchasers' prices, **digitally delivered**
Total	204,768	76,461	4,065,386	96,580	722,624	13,236	173,179	4,961,189	115,527
Digitally ordered	73,953	50,362	277,933	65,665	51,723	9,144	6,696	336,352	75,019
Direct from a counterparty	59,612	49,658	218,757	64,961	19,588	8,559	1,072	239,416	73,659
Via a resident digital intermediation	1,193	704	1,193	704	0	0	0	1,193	704
Via a non-resident digital intermediation	3,839	0	3,839	0	984	584	70	4,893	606
Via a resident retailer or wholesaler	9,308	0	54,144	0	31,150	0	5,555	90,849	50
Not digitally ordered	130,815	26,098	3,787,453	30,915	670,902	4,092	166,483	4,624,837	40,508

Source: (Statistics Canada, 2021[29]).

The breakdown of the nature of the transaction into rows (for digitally ordered) and columns (for digitally delivered) allows for a link with outputs from the digital trade framework, as all four ordering and delivery possibilities are represented:

1. digitally ordered and digitally delivered,
2. digitally ordered and non-digitally delivered,
3. non-digitally ordered and non-digitally delivered, and
4. non-digitally ordered and digitally delivered.

This avoids the need for many additional rows specifying the nature of delivery for each of the different methods of ordering.

In practical implementation, countries often assume that if services are digitally delivered then they must have been digitally ordered. While it is possible to think of examples where this does not hold (for example, in-store purchases of an internet or mobile subscription), these cases are considered to be only a small part of digitally delivered services.

Digital delivery will be discussed further in Chapter 3.

The goods and services produced (the "what")

While all goods and services produced in the economy are theoretically included in the Digital SUTs, the framework focuses on producing totals for ICT goods and digital services that fall within the SNA production boundary (see Overview). This includes all products that "must primarily be intended to fulfil or enable the function of information processing and communication by electronic means, including transmission and display" (UNSD, 2015[25]). This definition is used to determine the classification of ICT products included in the "alternative structures" section (part 5) of the CPC 2.1 (UNSD, 2015[25]).

In the conventional SUTs, ICT goods and digital services may be recorded in many product rows. In the Digital SUTs portions of these product rows should be aggregated to form two high-level rows: ICT goods and digital services.[12]

In addition, two products within ICT goods and digital services are of considerable policy interest and therefore will be shown separately in the Digital SUTs: digital intermediation services (DIS) and cloud computing services (CCS). Neither of these products is currently identified in existing product classifications, but they are of interest to users because they represent the production and consumption of a service that has fundamentally altered the way businesses operate.

The Digital SUTs also encourages the transactional breakdown of non-digital goods and services that are more likely to be digitally ordered and/or digital delivered. Examples include travel services, transport, accommodation and food services. Non-digital products that are rarely, if ever, transacted digitally (such as trade in primary commodities, or wholesale business services) are within scope of the Digital SUTs, but identifying the nature of the transaction for these products is a low priority.

A final inclusion from the product perspective within the Digital SUTs framework concerns three products that are outside the current SNA production and asset boundary. These are: *data*, *zero priced digital services provided by enterprises*, and *zero priced digital services provided by the community*. The status of data is expected to change in the 2025 SNA, as it is likely to be acknowledged as a Produced asset in the central framework ("core accounts"). However, production and consumption of zero priced digital services are likely to remain outside the central framework. Nevertheless, due to the analytical value of such estimates, countries are encouraged to complete these additional lines in the Digital SUTs. Completion could form the basis of a digital economy satellite account (DESA), discussed in the Overview.

More information on ICT goods and digital services and on the two newly identified digital products – DIS and CCS – is provided in Chapter 4. This chapter includes information on how countries are currently attempting to delineate ICT goods and digital services from existing product rows and to derive estimates of DIS and CCS.

The new digital industries (the "who")

The "who" perspective of the Digital SUTs relates to the creation of new digital industries. These industries are shown in separate columns in order to quantify digitally enabled activities that are not visible in the conventional SUTs. At present, seven new digital industries have been identified:

- The digitally enabling industry.
- DIPs charging a fee.

[12] This split into two rows partially relates to the measurement of goods and services being digitally delivered. While the concept of digitally ordered extends to all products including goods this is not the case for those that are digitally delivered. As in the Handbook on Measuring Digital Trade, it is assumed that goods cannot be digitally delivered. Therefore, while almost all products can be ordered digitally and more and more services are becoming available to be delivered on a digital basis, goods are still considered to be delivered on a non-digital basis only.

- Data- and advertising-driven digital platforms.
- Producers dependent on DIPs.
- E-tailers.
- Financial service providers predominantly operating digitally.
- Other producers only operating digitally.

The new digital industries are based on classifying producers by how they utilise digital technologies within their business models or to interact with consumers, rather than the fundamental type of economic activity undertaken,[13] which is the basis for classification in the conventional SUTs. For example, a retailer becomes an e-tailer if they receive most of their orders, based on value, digitally. In practice, this means that two economic entities that are currently classified in separate ISIC industries due to their fundamental economic activity may be placed in the same digital industry within the Digital SUTs if they are leveraging digitalisation in the same manner. For example, a bookmaker (gambling services) and a tertiary education provider (education services) would be classified separately in the conventional SUTs but would be placed together in *other producers only operating digitally* in the Digital SUTs, if they are both only delivering their services digitally.

Separating out firms and other producers into the new digital industries will provide important perspectives on the amount of output, value added, compensation of employees and even employment being provided by industries that are reliant on digitalisation. A broader discussion, covering the definition and possible collection methods for all digital industries is included in Chapter 5.

Outputs of the Digital SUTs

The Digital SUTs have not been designed to produce a single estimate that represents the whole digital economy. Rather, as discussed above, they are based on a multidimensional approach which generates estimates on a range of perspectives of the economy being affected by the digital transformation. Some examples of these outputs include:

- Household expenditure/consumption online (totals and breakdowns for specific products).
- The value of digitally traded goods and services.
- The value of ICT goods and digital services in the economy, and their (likely) growing contribution to production over time.
- Expenditure on products purchased via a third party (DIP).
- Digitally delivered products including the proportions delivered domestically and exported.
- The amount of output and value added produced by units within the new digital industries (producers that predominately interact with consumers on a digital basis).

[13] The exception is the digitally enabling industry where units are classified based on the products they are producing.

High priority indicators of the Digital SUTs

The Digital SUTs framework presented in this chapter is ambitious. The additional rows and columns are added to all products for consistency, but it is not expected that any country will be populating all rows and columns.[14] Therefore, the Informal Advisory Group on Measuring GDP in a Digitalised Economy proposed a set of high priority indicators for countries compiling Digital SUTs, focusing on some of the most important outputs from a user perspective. Agreeing on high priority indicators helps the co-ordination of initial results derived from the Digital SUTs and maximises its use as an internationally comparable framework. It also provides a more obtainable goal for countries to aim for in early stages of development.

The high priority indicators are:

1. ***Expenditure split by nature of the transaction.*** Indicators of expenditure broken down by nature of transaction are considered highly relevant because digital ordering and delivery are often seen as the most visual representation of the digital economy for consumers and policy makers. To monitor these developments, the following indicators are proposed:
   - total household final consumption expenditure digitally ordered;
   - total imports digitally ordered; and
   - total exports digitally ordered.

Initially, the priority for these indicators will be digitally ordered products as this is seen as more achievable in the short term. However, similar breakdowns for digitally deliverable products are also desirable.

2. ***Output and/or Intermediate consumption of DIS, CCS and total ICT goods and digital services.*** These three indicators of intermediate consumption provide insight into the evolution of the digital transformation across industries. While it is not possible to measure the exact amount of output or value added that is due to the impact of digitalisation on the production process, an increasing percentage of intermediate consumption of ICT goods and digital services relative to other products is considered to be a good indicator. Intermediate consumption of DIS and CCS is important to better understand which industries are being most disrupted by the use of intermediation platforms or require more flexible data storage to undertake their business.
3. ***Digital industries' output, gross value added (GVA) and its components***. This group of indicators relates to the seven new digital industries. If possible, the provision of subtotals for each of these industries is encouraged. Output and value added should preferably be valued at basic prices.

The initial high priority indicators were chosen after considering both their usefulness and interpretability for users as well as the feasibility of generating them in the short to medium term. There are a range of other indicators that could be pursued beyond the high priority indicators listed. For instance, as outlined in Box 2.2, looking at the characteristics of digital industries could provide useful information. While ideally countries should aim for the agreed high priority indicators, each country may wish to choose indicators produced by the Digital SUTs that are particularly relevant for them. Ultimately, the indicators published will reflect policy demands and source data availability for each country.

[14] The OECD database of conventional SUTs contains over 90 products. The splitting of all these products based on the nature of transaction would require an additional 540 rows. Many of the rows represent goods that cannot be digitally delivered, so the column representing the amount of this good digitally delivered is redundant.

Box 2.2. Alternative indicators

It is well known that firms benefit from the adoption and use of digital technologies, as they can boost efficiency and productivity while fostering innovation (Gal et al., 2019[30]) (Sorbe et al., 2019[31]). Collection and dissemination of information on the growth and level of investment in digital products, as well as labour-related indicators such as hours worked or occupations for the digital industries, are useful to policy makers. Such information can contribute to analysis of productivity and provide insights into the institutional make-up of firms that comprise the digital industries.

The establishment of digital industries based on digital attributes rather than economic activity also provides benefits. Surveys on innovation uptake, labour force strategy and firm behaviour can be undertaken in order to better understand the profile of digital businesses, including the differences between them and businesses which remain classified in their traditional industries. Such information gathering and comparisons have already been done for the ICT sector (the digitally enabling industry in the Digital SUTs). For example, it is well established that, within Europe, the ICT sector is significantly overrepresented in expenditure on research and development (R&D) relative to its contribution to Gross Value Added (Eurostat, 2022[32]). The digital economy now extends beyond simply the ICT sector, so while indicators about business behaviour and profiles of units within the digital industries are not an explicit indicator included in this handbook, the definitions and classification of the digital industries offer an opportunity to further differentiate firms, allowing for greater comparison and analysis.

3 The nature of the transaction (the "how")

The nature of the transaction is a fundamental element of the Digital Supply and Use Tables (SUTs) framework. The Digital SUTs break down rows and columns based on whether the product was digitally ordered and/or digitally delivered. This chapter looks at the nature of ordering and of delivery, provides definitions and explores the data sources. It also introduces digital ordering via digital intermediation platforms and considers consistency with the digital trade framework and treatment of digitally ordered retail margins.

Introduction

This chapter focuses on the nature of the transaction when ordering and delivering products (the "how", discussed in Chapter 2). The use of this perspective to delineate existing transactions is a defining aspect of the Digital Supply and Use Tables (Digital SUTs). While many other extended SUTs and satellite accounts include breaking up or aggregating existing products and industries, the splitting of a single product row based on the nature of the transaction is new. Importantly, this allows the Digital SUTs to provide an indicator of the impact of digitalisation on the ordering and provision of digital products as well as those products traditionally viewed as non-digital.

While the concept of splitting transactions based on the nature of the transaction is new for SUTs, it is already well established in business and household surveys. Some of these examples are discussed in this chapter, including their usefulness in producing Digital SUTs.

The nature of the transaction is also the fundamental link between the compilation of Digital SUTs and digital trade estimates, which are not only incorporated into the Digital SUTs but are a standalone statistical output. This connection is also discussed in the chapter.

This chapter will begin by outlining the concepts of digital ordering and digital delivery in more detail than in Chapter 2. It will then present some examples of data sources that countries may use to break down product and total rows in the Digital SUTs. The final section covers the breakdown between the retail margin and non-margin components for goods purchased digitally.

The nature of the transaction: ordering and delivery

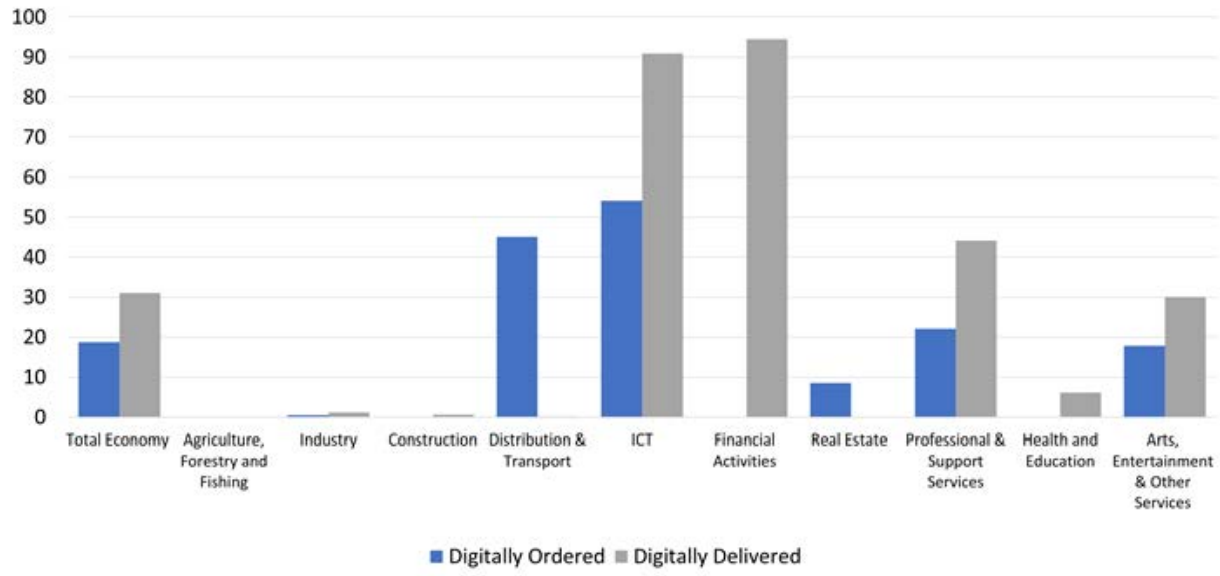
The nature of the transaction is a fundamental element of the Digital SUTs. As discussed in Chapter 2, conventional Supply and Use Tables (SUTs) make no distinction on how the transaction is facilitated, focusing only on what product was produced, who produced it, and who consumed it. Within the Digital SUTs, the nature of transactions is reflected in two ways:

- Six additional rows, under each product category and total, separating transactions by how they are ordered.
- Two additional columns, located after certain expenditure aggregates, showing what part of the products is digitally delivered.

Compilers can present the nature of the transaction from either the supply or the use perspective. Figure 3.1, from the Central Statistics Office (CSO) Ireland, shows the proportion of goods and services produced that were digitally ordered and/or digitally delivered in 2020. In this case, the estimates are aggregated from rows on the supply table.

Figure 3.1. Proportion of output digitally ordered and digitally delivered, Ireland, 2020

% of total output in the sector



Note: Digitally ordered output may include digitally delivered output and vice versa.
Source: (CSO Ireland, 2022[33]).

Nature of ordering

A product can be either digitally ordered or not digitally ordered. Digitally ordered transactions can be further broken down into *ordered directly from the counterparty, ordered via a resident digital intermediation platform*, and *ordered via a non-resident platform*, as shown in Table 3.1 for accommodation services.

Table 3.1. Transaction types in Digital SUTs: accommodation services example

Accommodation services	
A	Digitally ordered
A_i	Direct from a counterparty
A_ii	Via a DIP
A_ii_1	Via a resident DIP
A_ii_2	Via a non-resident DIP
B	Not digitally ordered

Source: The authors.

As described in Chapter 2, the additional transaction breakdown is also applied to the rows displaying the total (or aggregate) of all products that are standard in conventional SUTs. The addition of the breakdowns at this level allows for the creation of high priority indicators such as digitally ordered estimates of total exports, total imports and total household consumption. While these totals can be calculated by summing up the digitally order components for each product, countries producing these estimates may find it more practical to apply transaction indicators directly to the totals.

Digitally ordered

The first line (Row A) of Table 3.1 shows digitally ordered services. In this handbook, a digitally ordered transaction is defined as:

> *"The sale or purchase of a good or service, conducted over computer networks by methods specifically designed for the purpose of receiving or placing orders".*

This definition is the same as that in the Handbook on Measuring Digital Trade (IMF, OECD, UNCTAD, WTO, 2023[13]), and is consistent with the one first put forward by the OECD in the Guide to Measuring the Information Society in 2011:

> *"An e-commerce transaction is the sale or purchase of a good or service, conducted over computer networks by methods specifically designed for the purpose of receiving or placing orders. The goods or services are ordered by those methods, but the payment and ultimate delivery of the goods or services do not have to be conducted online. An e-commerce transaction can be between enterprises, households, individuals, governments, and other public or private organizations. To be included are orders made over the web, extranet or electronic data interchange. To be excluded are orders made by phone, fax or manually typed email." (OECD, 2011[28])*

The alignment in concepts and terminology with previous initiatives provides clarity for users and ensures that compilers can leverage the measurement instruments already in place (such as e-commerce surveys) to produce estimates of digital trade.

The full definition from the 2011 Guide to Measuring the Information Society includes the specific exclusion of orders made by phone, fax or manual email. This exclusion has been a point of discussion (see Box 3.1. The different definitions of digitally ordered). As can be seen in Table 3.2, the approaches vary between countries (including between OECD countries). Therefore, it is unlikely that all surveys used to measure e-commerce and digitally ordering will converge to a single definition. This underlines the need for compilers to explain clearly to users what is and is not included in their Digital SUT outputs.

Table 3.2. Classification of economies by features of e-commerce definitions

	Excludes orders via manually typed email	Includes orders via manually typed email
All "Computer Networks"	Austria China France Hong Kong Japan Korea (Rep.) Malta Philippines Singapore Spain United Kingdom	United States
Internet only	Canada Malaysia	Australia Indonesia Mexico Thailand

Source: (UNCTAD, 2022[34]).

Box 3.1. The different definitions of digitally ordered

An important consideration in the OECD's 2011 definition of digitally ordered in the Digital SUT framework is the wording "over computer networks by methods specifically designed for the purpose of receiving or placing orders" (OECD, 2011[28]). Since this definition has been in place, it has been used in many (but not all) of the e-commerce surveys conducted by statistical offices. For example, in Australia's "purchases made via the internet" (Australian Bureau of Statistics, 2022[35]) and in the United Kingdom's "total retail sales generated via the internet" (ONS, 2022[36]), the language of "via the internet" is used; but both definitions of internet sales are based on the previously mentioned OECD definition of e-commerce. (Australian Bureau of Statistics, 2013[37]) (ONS, 2019[38]).

The clarification in the OECD's 2011 definition was required because digitalisation has not just transformed how producers and consumers buy and sell but also how people communicate. Most communication nowadays is digital, so it could be argued that an order placed using digital hardware (a mobile phone or email) is digitally ordered. Previous OECD definitions of e-commerce had a more ambiguous definition: transactions "conducted over computer-mediated networks". In response to concerns about different interpretations of what a computer-mediated transaction is, it was decided to make the exclusion of orders made via emails and phones more explicit (OECD, 2011[28]).

Additionally, while email reflects the impact of digitalisation, it is still fundamentally a communication device. The actual business process and accompanying production is still the same as if the order was made physically, with a human being likely to be required to read and action the email. This is in contrast to automated systems, which can generate demand for production simply by the consumer pushing buttons. Finally, the exclusion of email results in a definition that is more pragmatic and clearly defined, which avoids misinterpretation by compilers and users (OECD, 2011[28]).

Statistics Canada makes this clear by noting that "online sales, or electronic commerce (e-commerce) refers to all sales of a business's good or service where orders were received, and the commitment to purchase was made, over the internet. [Respondents should] include sales made on this business's or organization's website and third-party websites and apps. [Respondents should] exclude the delivery of digital products and services for which orders were not made online and orders received or commitments to purchase made by telephone, facsimile or email." (Statistics Canada, 2022[39])

A similar distinction is made by Eurostat which considers e-commerce "the sale or purchase of goods or services, whether between businesses, households, individuals or private organizations, through electronic transactions conducted via the internet or other computer-mediated (online communication) networks […] Orders via manually typed e-mails, however, are excluded" (Eurostat, 2022[40]).

The US Census Bureau, on the other hand, takes a broader approach. In their annual retail trade survey, they define e-commerce as "the sales of goods and services where the buyer places an order, or the price and terms of the sale are negotiated, over an internet, mobile device (M-commerce), extranet, Electronic Data Interchange (EDI) network, electronic mail, or other comparable online system. Payment may or may not be made online" (United States Census Bureau, 2020[41]). It would be useful to try to quantify how much this difference in definition impacts on the estimates of e-commerce in the United States compared with Europe, Australia and Canada.

The United Nations Conference on Trade and Development (UNCTAD), in its Manual for the Production of Statistics on the Digital Economy (UNCTAD, 2021[42]), advocated collecting data on orders received or placed over the internet, including by email, in order to reflect different levels of technological development across countries. During a recent stocktake exercise, UNCTAD presented a list showing whether the definitions used by countries a) cover all computer networks or just the internet and b) include manually typed emails.

A key aspect of the rise in digital ordering has been the increase in the role of Digital Intermediation Platforms (DIPs) in facilitating orders. Therefore, digital ordering is broken down into two categories:

- Orders that are made directly from the counterparty to the transaction (the producer or retailer), and
- Orders that are made via a DIP.

The Informal Advisory Group on Measuring GDP in a Digitalised Economy decided to separately identify transactions involving DIPs due to their disruptive role in the economy, the high policy interest and specific measurement challenges they pose. Chapter 4 covers DIPs in more detail.

An "of which" split is made to transactions recorded via a DIP into those made via resident DIPs and those made via non-resident DIPs. This gives the final breakdown shown in Table 3.1. A more detailed definition of each of these categories is provided below.

Digitally ordered direct from a counterparty

The second line (Row A_i) of Table 3.1 shows the category "digitally ordered direct from a counterparty", which involves the digital ordering of products directly with the producer or retailer (the owner of the product). This would usually occur via the producer's website or application ('app') and cannot involve any other third party to the transaction. Examples include the purchase of flights direct from an airline's website, or clothing direct from the brand's website or a loaf of bread via a supermarket's e-commerce app. While in these examples there is a difference between the airline (the producer of the services ultimately provided) and the supermarket (a retailer, not the producer of the bread), they both have ownership of the product being purchased, so they are both considered a counterparty to the transaction.

Ordered via a resident or non-resident DIP

The transaction ordered "via a DIP" in the third line (Row A_ii) of Table 3.1 involves any good or service purchased through a DIP. This is a sub-set of "digitally ordered" because, by convention, all ordering via a DIP must be digital in nature (IMF, OECD, UNCTAD, WTO, 2023[13]). In this case, the DIP has no ownership of the good or service being purchased and is acting only as a facilitator of the transaction, bringing the buyer and seller together. A broader discussion on DIPs, including transactions relating to them, is provided in Chapter 4.

There is an additional split between DIPs that are residents of the same country as the institutional unit undertaking the ordering and DIPs that are non-residents. This additional split may be difficult to compile due to the lack of information that consumers have on the DIP they are using. This is one of the aspirational outputs of the Digital SUTs. It is included because having a split between purchases via resident and non-resident DIPs would help to determine the amount of digital intermediation services being imported compared with the amount that is produced and consumed domestically. The estimation of this non-resident split may be possible to do in different ways, including even as a residual if the amount of total intermediation services consumed and the amount produced domestically are both known.

Not digitally ordered

The final transaction row (Row B) in Table 3.1 represents orders made non-digitally, which are also part of the breakdowns shown in Digital SUTs. A transaction being included in this row does not preclude electronic payment if the item was ordered physically or via other non-digital means, such as on the phone. Conceivably, a transaction could be recorded in this row while also being recorded as digitally delivered. An example is mobile or broadband telecommunication services that may be purchased "over the counter" but are delivered digitally. That said, the vast majority of transactions that are recorded in this row will also be delivered non-digitally.

Since this is the traditional mode of transactions, it is assumed that this row will likely be populated as a residual. In other words, output when it is taken from the conventional SUTs will be considered as non-digital by default, until it is moved to one of the "digitally ordered" rows.

There is no further breakdown under the "not digitally ordered" transaction row because all products that are non-digitally ordered are, by definition, ordered directly from the counterparty (producer) rather than via a DIP.

Nature of delivery

Products can be delivered digitally or non-digitally. The nature of the delivery is represented as breakdowns of the columns for total output, total imports, total exports, and total household consumption expenditure, shown as "of which" items. Unlike digital ordering, there is only one choice: digitally delivered or not digitally delivered.

Digitally delivered is defined within the Digital SUTs as "transactions that are delivered remotely over computer networks". This definition is consistent with that used in the Handbook on Measuring Digital Trade (IMF, OECD, UNCTAD, WTO, 2023[13])[15] and includes the delivery of digital services, such as telecommunications, software and cloud computing, as well as the digital delivery of some non-digital services such as education and gambling.

The breakdown of the nature of the transaction into rows (for digitally ordered) and columns (for digitally delivered) provides a consistent way to record all the different interactions between producers and consumers as all four ordering and delivery possibilities are represented. These are:

1. digitally ordered and digitally delivered;
2. digitally ordered and non-digitally delivered;
3. non-digitally ordered and non-digitally delivered; and
4. non-digitally ordered and digitally delivered.[16]

This avoids the need for many additional rows specifying the nature of delivery for each of the different methods of ordering.

Digitally delivered vs digitally deliverable

Some services are entirely digital in nature and as such, as well as meeting the definition of a digital product (see Chapter 4), they will always be digitally delivered. For example, downloadable software and streaming media will always be delivered digitally as it is not possible to provide them in a non-digital manner. Therefore, for such products, all output is digitally delivered output. Conversely there are certain products, including all goods (by convention), that are not possible to deliver digitally. Also included in this category are many transport services, such as train or aeroplane travel, even if the service is purchased and the

[15] The definition used in the Handbook on Measuring Digital Trade is: "All international trade transactions that are delivered remotely over computer networks." While the amounts represented in the Digital SUTs include cross-border transactions, they also include deliveries made domestically.

[16] It appears that in practical implementation of this framework, countries have often considered that if services are digitally delivered, they have also been digitally ordered. While it is possible to think of examples where this does not hold, such as the in-store purchase of an internet or mobile subscription, these are considered to be a small minority of all services digitally delivered and therefore the assumption is considered reasonable.

ticket received digitally. As the person must physically board the aeroplane or train to consume the service, it is received non-digitally. Therefore, the output is considered to be "not digitally delivered".

There is also a group of services which can be digitally delivered but need not be. These services, referred to as "digitally deliverable", can be delivered through computer networks (most often the internet). For example, in recent years there has been a rise in online education, and some universities are now only online. The COVID-19 pandemic increased digital delivery of education services, but most education services are still delivered physically, so such services are considered to be "digitally deliverable". The first list of "digitally deliverable services", at the time labelled as "potentially ICT-enabled services", was developed in the context of international trade by the UNCTAD-led Task Group on Measuring Trade in ICT Services and ICT-enabled Services (TGServ) in 2015. This list has now been expanded in the Handbook on Measuring Digital Trade (IMF, OECD, UNCTAD, WTO, 2023[13]) to include digital intermediation services provided by DIPs. Identifying digitally deliverable services and measuring exports and imports of those services is the recommended starting point for compiling statistics on digital trade outputs.

In a similar vein, this handbook advocates the concept of "digitally deliverable" as a first stage indicator that countries may use in compiling Digital SUTs. A Central Product Classification (CPC)-based list of digitally deliverable services is included in Annex 3.A.[17] This classification provides a basis for compiling an upper-bound estimate of transactions that are "actually digitally delivered" offering a solution to a couple of well-known challenges.

The first challenge is that, in practice, applying the concept of digitally delivered is not always as clear-cut as digitally ordered. Digital ordering of a product usually occurs instantaneously, when the button is pushed on the computer or phone. On the other hand, delivery of professional services, such as accounting, legal or engineering services may be a mixture of in-person and email exchanges. A person may receive financial services without ever stepping foot in a physical bank, but such a decision is often the choice of the consumer rather than the bank. The customer may switch between physical and digital without any interruption to the financial service they are receiving. Applying the digitally delivered concept in complex cases such as these may be challenging and requires the collection of detailed information. By contrast, it is relatively straightforward to identify whether a class of products is digitally deliverable (i.e. can be digitally delivered).

Secondly, as indicated by the scarcity of examples for collection of data on digital delivery, the measurement of digitally delivered to domestic markets has often taken a lower priority than e-commerce and digital ordering. This may reflect both the conceptual difficulties and lower policy priorities.

Therefore, compilers of Digital SUTs may consider measures of "digitally deliverable" as a starting point to develop estimates of product that are digitally delivered. As will be discussed in Chapter 6, Ireland and the Netherlands have taken this approach, whereas Canada has tried to identify the specific services and level of products being actually digitally delivered. Table 3.3 shows that these different approaches can create big differences in results, reducing comparability between countries and requiring additional explanation for users. However, the compilation of potentially digitally deliverable allows for greater consistency with digital trade estimates.

[17] The digitally deliverable list in Annex 3.A is slightly different from the list in the Handbook on Measuring Digital Trade, which is based on the Extended Balance Of Payments Service Classification (EBOPS). EBOPS is a more aggregated classification than the CPC-based approach used in this handbook, resulting in some detailed products which are clearly not digitally deliverable being included in the digital trade version through their incorporation into higher level aggregates.

Table 3.3. Estimates of digitally delivered in Ireland, Netherlands, and Canada

	Ireland	Netherlands	Canada
Digitally Delivered (% of total output)	28.5	22.6	2.4

Note: Ireland and Netherlands are recording digitally deliverable products. Canada is recording products actually digitally delivered. Ireland's estimates are for 2020, Netherlands and Canada's estimates are for 2018.
Source: OECD using (CSO Ireland, 2022[33]) (Statistics Canada, 2021[29]) (Statistics Netherlands, 2021[43]).

Consistency with measurement of digital trade

Importantly, splitting product rows and totals columns based on the nature of the transaction permits the creation of aggregate estimates of digitally ordered goods and services and digitally delivered services. These include imports of digitally delivered services in the supply table and digitally delivered exports in the use table. Additionally, the aggregate proportion of goods imported and exported that were digitally ordered is presented in the product rows.

The definitions of digitally ordered and digitally delivered are consistent with that used in the Handbook on Measuring Digital Trade (IMF, OECD, UNCTAD, WTO, 2023[13]). As such, digital trade estimates can be used in the Digital SUTs or vice versa. In their initial Digital SUTs, Statistics Canada estimated that 7.0% of imports were digitally ordered and just under 2.0% of imports were delivered digitally (Statistics Canada, 2021[29]). The benefits of consistency between the digital trade and Digital SUT frameworks extends beyond the numbers. It allows sharing of best practices between the two communities on methodology, data collection and conceptual interpretation (see Box 3.2).

As shown in a fuller description of the digital trade framework (see Annex 3.B), while the concepts are the same, the product breakdown applied within digital trade reporting is normally less detailed than that of supply and use tables. The digital trade reporting template requests services broken down by the Extended Balance Of Payments Service Classification (EBOPS).

Importantly, although EBOPS produces higher-level breakdowns than the Classification of Products by Activity (CPA) or CPC[18] which are used to compile most conventional SUTs, there are already established concordances between EBOPS, CPA and CPC, and it is envisaged that during the early stages of compilation, compilers would focus on being consistent at the higher level of imports and exports (i.e. total goods and total services).

[18] The CPA and CPC are, respectively, the European Union's and United Nations' official classifications of products by activity.

Box 3.2. Consistency between Digital SUT and digital trade concepts

Additional clarification on certain digital ordering concepts

Consistency between the concepts and definitions used when compiling estimates of digital trade and the Digital SUTs is important. The most obvious advantage of such consistency is that estimates created as part of digital trade can also be used when completing the high priority indicators as part of the Digital SUTs. Imports and exports, split based on the nature of the transaction, are a key component of the high priority indicators from the transaction perspective.

This consistency also allows for best practices and methodology to be shared between compliers, as well as for clarification of definitional and conceptual interpretations. Several of these, which relate to digital ordering and delivery, are explained in the Handbook on Measuring Digital Trade:

- For digitally ordered transactions, the payment and ultimate delivery of the goods or services do not have to also be conducted online.
- Orders made by phone, fax or manually typed email are excluded from digitally ordered trade.
- Offline transactions formalised using digital signatures are excluded from digitally ordered trade.
- Each trade transaction should be treated separately. When a transaction is established via offline ordering processes, but subsequent transactions (or follow up orders) are made via digital ordering systems, the follow-up orders should be considered as e-commerce.

The Handbook on Measuring Digital Trade also provides clarity regarding the treatment of on-going provision of services with accompanying payments (recurring transactions). Examples include subscriptions to streaming media, online software and gaming services, subscriptions for online platform delivery services and clothing rental subscriptions. Although the order is placed only once, the service continues over subsequent periods as long as it is not cancelled, and the subscription fee is paid. While the transaction (and value) associated with the initial digital order should clearly be included in the estimate of supply (and use) digitally ordered, the subsequent transactions should also be regarded as digitally ordered (i.e. an extension of the original digital order) and be recorded in digitally ordered trade.

Additionally, based on discussions with several organisations, it appears that most surveys consider these recurring payments as a continuation of the initial order, and reflect its nature. While some are attempting to make this conceptual treatment more explicit in their survey wording, in practice it is likely that firms will not have the information needed to identify the original ordering method associated with recurring payments – especially for subscriptions which began years or even decades ago. It may therefore be necessary to estimate the share of total subscription income in the current period arising from digital orders. One possibility, advocated by the Handbook on Measuring Digital Trade, is to create an estimate based on the share of digital ordering among subscriptions initiated in the current recording period. This can be conceived as reflecting the share of digital ordering which would arise if customers had to place a new order each time instead of the service automatically renewing.

Importantly, the Handbook on Measuring Digital Trade provides a useful complimentary resource to this handbook with additional examples and case studies that compilers can use to improve measurement.

Source: (IMF, OECD, UNCTAD, WTO, 2023[13]).

Data sources

Data that provides information on the level and characteristics of digital ordering and delivery can be obtained from either the producer/seller perspective or the consumer/buyer perspective. This section discusses some of the existing and proposed methods to collect this information.

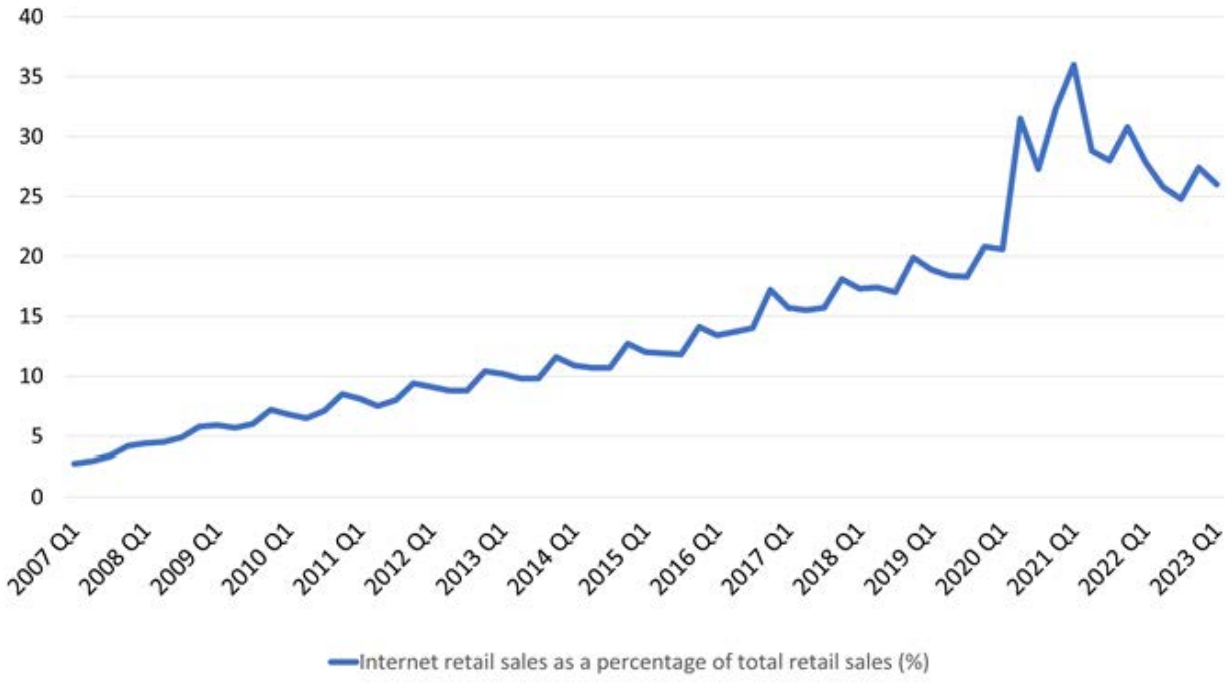
The producer or seller perspective (business surveys)

Digital ordering

National statistical offices may add questions to existing business surveys to gather information on the nature of the transaction. Examples include the United Kingdom Office for National Statistics (ONS) and the Australian Bureau of Statistics (ABS), which use such information to provide estimates about retail sales that take place online (Figure 3.2 and Figure 3.3), without providing additional information on the specific activity of the business or the products being transacted.[19]

Figure 3.2. Internet retail sales, United Kingdom, Q1 2007 to Q1 2023

% of total retail sales

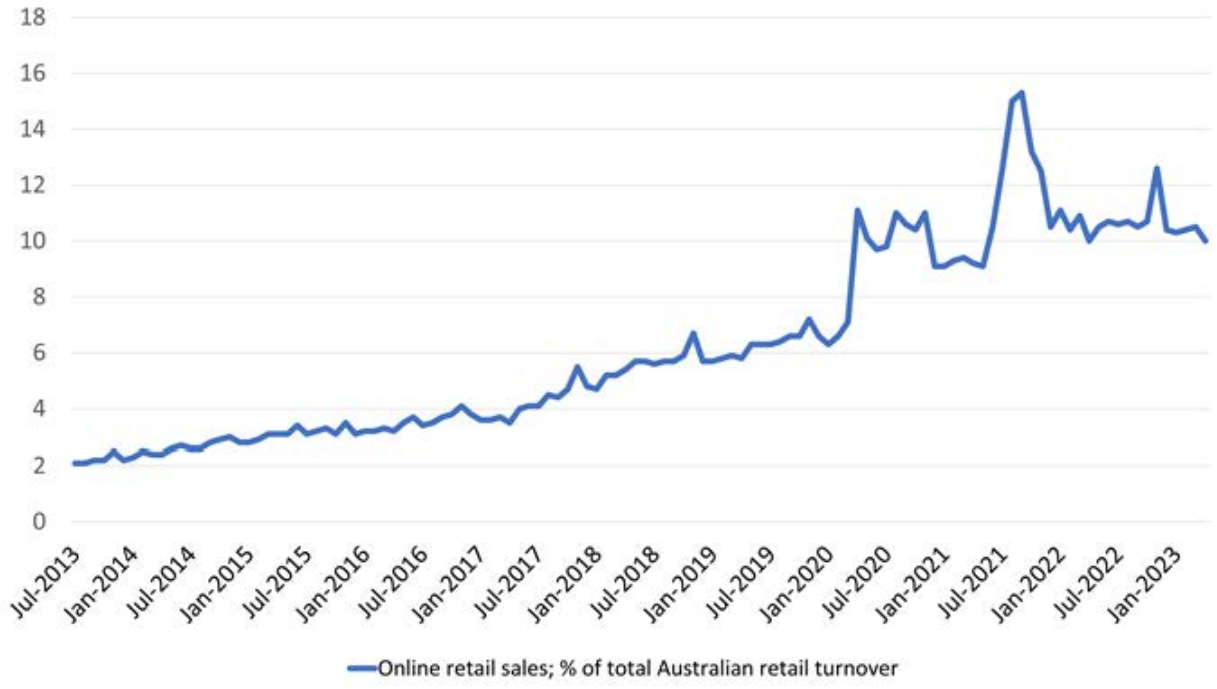


Source: (ONS, 2022[36]).

[19] The ONS has added a separate question to its monthly business survey specifically asking about total retail sales generated via the internet only. Similarly, the ABS has added an additional question to its monthly retail trade survey.

Figure 3.3. Online retail sales, Australia, July 2013 to April 2023

% of total retail turnover



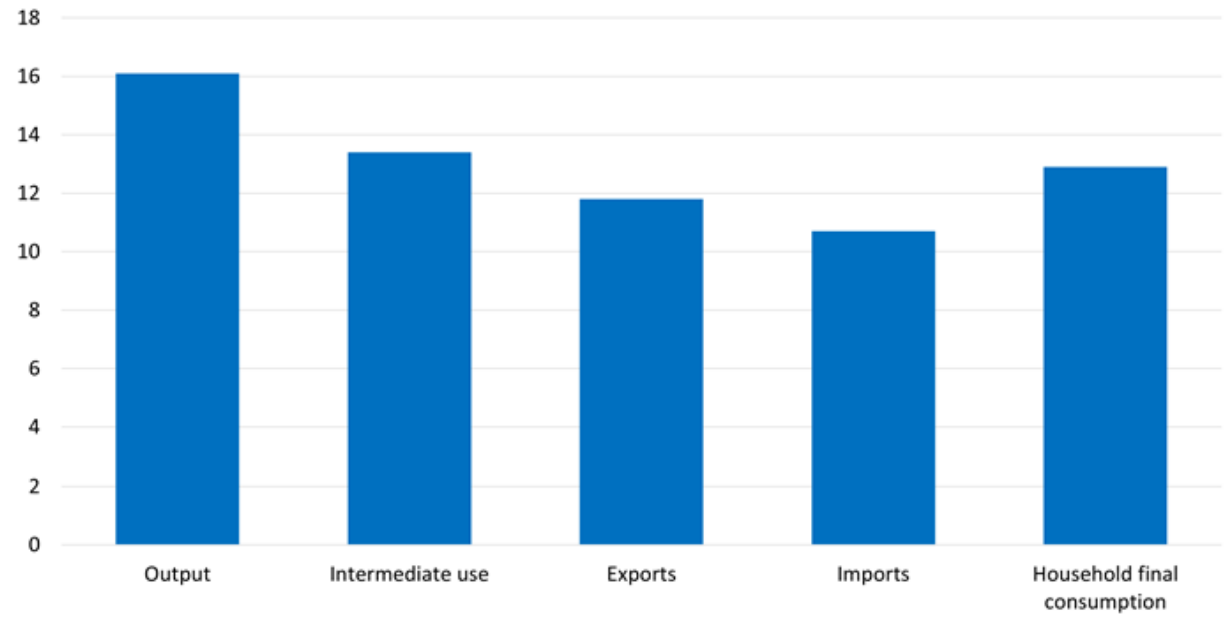
Source: (Australian Bureau of Statistics, 2022[35]).

Within Europe, many countries publish estimates for e-commerce collected via surveys based upon Eurostat's enterprise survey on Information and Communication Technology (ICT) usage and e-commerce (Eurostat, 2021[44]). These provide information either on the percentage of firms that offer e-commerce as an ordering option or the percentage of turnover from e-commerce. Annex 3.C provides examples of the survey questions used by Eurostat.

The ICT usage and e-commerce survey is the main data source for estimates of digital ordering published by Statistics Netherlands. Information from this survey was used together with data from the structural business survey and the household budget survey to break down estimates from the conventional SUTs. Estimates of digital ordering were applied to rows in both the supply and use tables, but only the aggregate estimates were published. These include total output and imports from the supply table; and exports, intermediate use and household final consumption from the use table. The results are shown in Figure 3.4.

Figure 3.4. Proportion of digitally ordered products, Netherlands, 2018

% of total that is digitally ordered



Source: (Statistics Netherlands, 2021[43]).

E-commerce estimates provide analytical value, for example providing insights into consumer behaviour during specific peak seasons such as Christmas and the increasing global phenomenon of Black Friday, as well as trends during periods such as the COVID-19 lockdowns. The United States, for example, publishes annual estimates of e-commerce at the aggregate level (See Box 3.3).

However, often these are high-level aggregates, and this limits their usefulness for the purpose of compiling product rows in the SUTs. Some national statistical offices are going further in their business data collection in this area, seeking to gain more information than just totals and proportions. This more granular data, collected in the United States via the annual retail trade survey (Table 3.4) and the service annual survey provides additional opportunities for compilers.[20]

[20] The annual retail trade survey and the service annual survey are available at the following links. Annual retail trade survey: https://www.census.gov/data/tables/2020/econ/arts/annual-report.html. Service annual survey: https://www.census.gov/programs-surveys/sas.html.

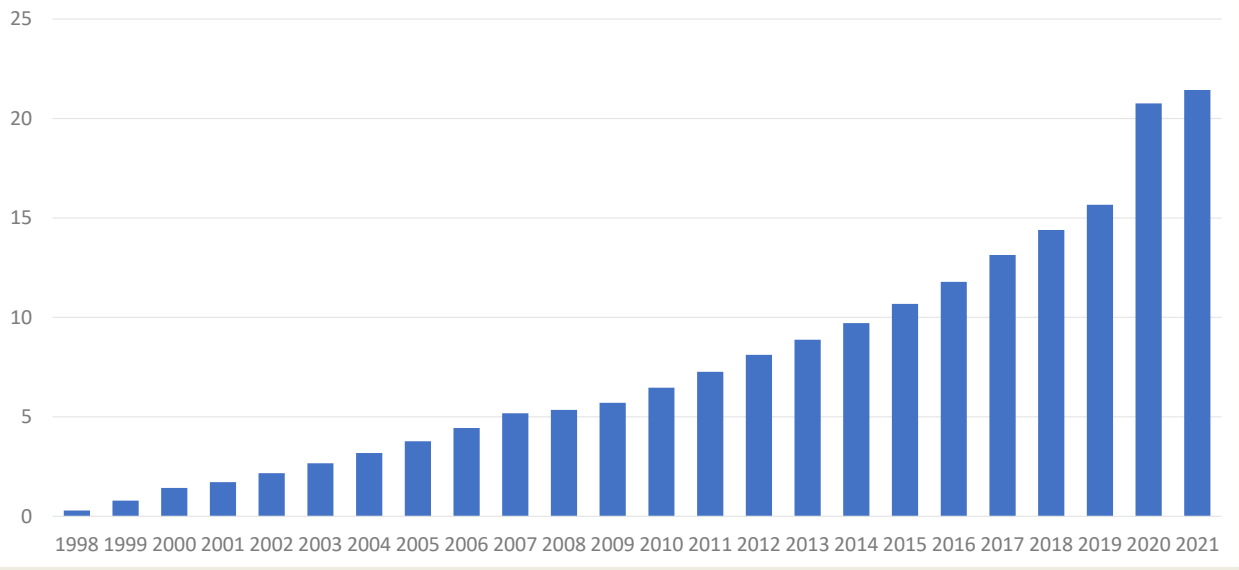
Box 3.3. Spotlight on e-commerce retail sales trends in the United States

Figure 3.5 below is based on the US Census Bureau's retail sales survey, which provides quarterly and annual e-commerce data. The survey shows the increasing share of e-commerce in retail sales over the long term, from less than 1% in 1999 to over 21% in 2021. with a noticeable jump in 2020 in response to COVID related restrictions. These results also informed the policy discussions about how the COVID-19 pandemic accelerated the adoption of digital retail as the proportion of retail sales undertaken via e-commerce jumped from 15.6% in 2019 to 20.7% in 2020.

Standardising and integrating e-commerce data into final demand estimates via the Digital SUTs framework could throw more light on e-commerce at detailed product levels and make this information more accessible to a wide range of policy users.

Figure 3.5. Share of e-commerce in retail sales, United States, 1998-2021

% of retail sales



Note: Retail sales of motor vehicles and parts dealers and gasoline stations are excluded from the author's illustrative calculation of e-commerce share because they account for roughly 30% of total retail sales with relatively little e-commerce involved.
Source: (United States Census Bureau, 2022[45]).

Table 3.4. Estimated annual retail trade sales: total and e-commerce, United States, 2021

NAICS Code	Kind of business	2021	
		Total (Million US dollars)	E-commerce
	Total retail trade	6,522,609	958, 715
441	Motor vehicles and parts dealers	1,484,108	D
442	Furniture and home furnishings stores	140,586	4,529
443	Electronics and appliance stores	93,511	2,761
444	Building material and garden equipment and supplies dealers	480,946	2,852
445	Food and beverage stores	889,145	26,706
446	Health and personal care stores	387,000	D
447	Gasoline stations	566,086	S
448	Clothing and clothing access. stores	290,652	20,495
451	Sporting goods, hobby, musical instrument, and book stores	102,493	6,328
452	General merchandise stores	797,704	D
453	Miscellaneous store retailers	159,503	8,722
454	Non-store retailers	1,130,875	823,803
4541	Electronic shopping and mail-order houses	1,027,971	820,843

Note: "D" - Estimate withheld to avoid disclosing data of individual companies; data are included in higher-level totals. "S" - Estimate withheld as it does not meet US Census Bureau's publication standards because of high sampling variability, poor response quality, or other concerns about the estimate's quality.
Source: (United States Census Bureau, 2022[45]).

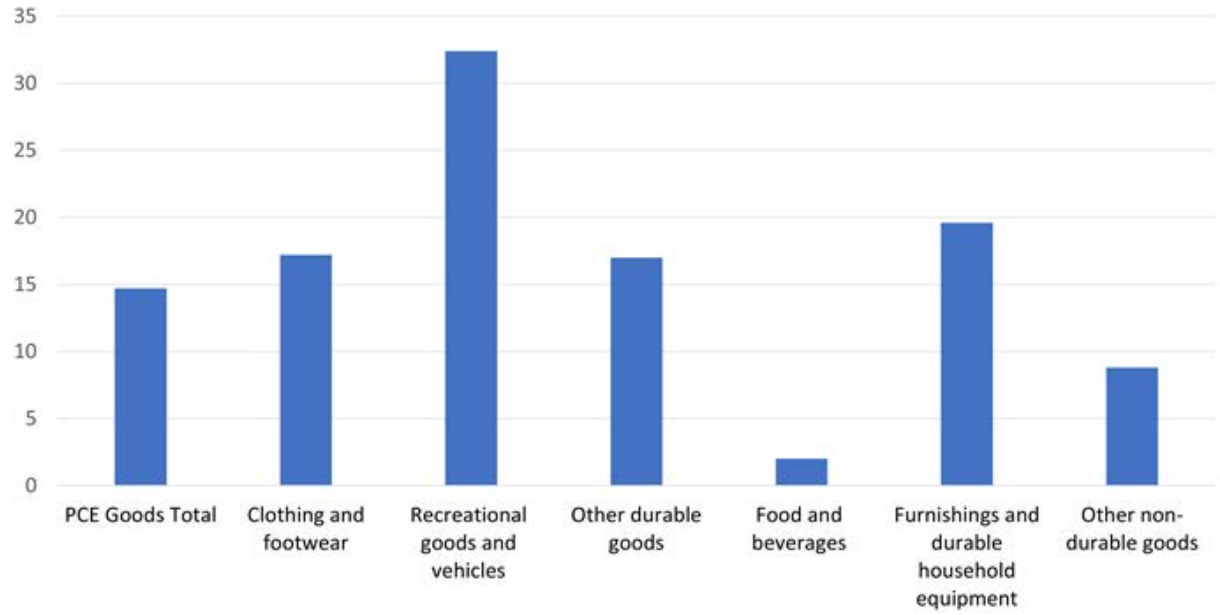
The United States retail trade survey shows that e-commerce made up 14.6% of total sales in the retail industry in 2020. It takes place in all retail industries, but most of the transactions occur within a single sub-industry: non-store retailers. This sub-industry is defined in the 2017 North American Industry Classification System (NAICS)[21] as "mail-order houses, vending machine operators, home delivery sales, door-to-door sales, party plan sales, electronic shopping, and sales through portable stalls" (NAICS, 2017[46]). Therefore, it covers transactions in a range of products that are separately identified in the conventional and Digital SUTs. On the other hand, many of the other sub-industries in Table 3.4 probably contribute to only one or two product rows, allowing for more straightforward link with "digitally ordered" in the Digital SUTs.

In its most recent digital economy publication, the BEA has used this e-commerce data to split up private consumption estimates (PCE)[22] from the conventional SUTs. These outputs contrast with those compiled by Ireland's CSO and shown in Figure 3.1, in that they show the nature of the transaction from the perspective of rows on the use table. The BEA data is displayed in Figure 3.6. It shows that in 2019, 14.7% of total PCE was digitally ordered. Similar to the Irish estimates, the nature of the transaction (in this case digitally ordered) is not shown for every row in the SUT; rather, rows have been aggregated to an appropriate level that improves the quality of the output.

[21] The NAICS is a regional version of the International Standard Industrial Classification (ISIC).
[22] PCE is considered commensurate with private final consumption expenditure.

Figure 3.6. Digitally ordered share of selected PCE goods by type of product, United States, 2019

% of goods that are digitally ordered



Note: PCE goods excludes motor vehicles and parts, gas and other energy goods, pharmaceutical and other medical products and tobacco.
Source: (Bureau of Economic Analysis, 2022[47]).

Other sources can also be used to estimate e-commerce. Statistics Netherlands uses tax records and web scraping to derive estimates of imports of e-commerce, that is consumers in the Netherlands digitally ordering goods from non-resident enterprises (see Box 3.4).

Box 3.4. Measuring e-commerce imports in the Netherlands

To measure expenditure by Dutch consumers at webshops located elsewhere in the EU, a study by Statistics Netherlands used the Dutch VAT returns filed by foreign EU companies, which are mandatory across the EU for all traders exporting more than a certain threshold (EUR 35,000 or EUR 100,000 per year, depending on the EU Member State) to another EU Member State.

The VAT returns were combined with data from Bureau Van Dijk's Orbis, a database of companies across the world. This was used to identify enterprises engaged in retail as their primary or secondary activity. Statistics Netherlands was able to match VAT records to company names, and also to match the companies with data collected through web scraping to identify the websites of the shops through which products can be ordered online. Webpages were identified on the basis of the company name, with sites checked (automatically) for the display of a shopping cart. Manual checking was undertaken to gauge the size of measurement errors in the algorithm.

The results indicate that Dutch consumers spent over 1 billion euros (excluding VAT) on products sold by foreign EU webshops in 2016, an increase of 25% relative to 2015, and six times higher than the value previously recorded with demand-side surveys of consumers. More than half of all online purchases were made at webshops located in Germany, followed by the United Kingdom, Belgium and Italy. Clothing and shoes were the main items purchased.

Source: (Meertens et al., 2019[48]), (Statistics Netherlands, 2019[49]).

Classification changes

Breakdowns depend on the classifications used for e-commerce providers. In the updated version of the NAICS released in 2022, the split between store and non-store has been removed, with retail sales primarily being classified by product rather than by the method of sale (NAICS, 2022[50]). A similar change was made for the recent revisions to the statistical classification of economic activities in the European Community (NACE), and the International Standard Industrial Classification (ISIC). In ISIC Revision 5, which was endorsed by the UN Statistical Commission in 2023 (see Chapter 5), the classification has "eliminated the distinction between in-store and non-store retail trade in Division 47" (UNSC, 2022[51]).

Such changes, when implemented by countries, will help provide information on breakdowns at product level of digitally ordered transactions. In the future, e-commerce transactions are unlikely to be reported as consolidated in a single sub-industry, but instead will be spread across different industries, allowing for a better analysis of which products are being ordered on a digital basis. However, practical considerations, especially regarding firms that sell a wide range of products, may still cause compilation challenges.

Comparability

It is important to note that while most of these examples, as well as others not listed here, attempt to measure the same conceptual phenomenon (e-commerce), there are small differences between surveys used as data sources in different countries. Some of these differences relate to the question wording used in relation to digital ordering (see Box 3.1). Others might include scope differences regarding who the survey is sent to, for example only include enterprises explicitly classified in the retail industry versus all stores that provide retail services.

As will be further discussed in Chapter 6, in some regards these differences do not matter if the results are only being used as an indicator to break down rows and columns rather to create an estimate of the level of digital ordering and delivery. If the conventional SUTs are being used and are accurately compiled,

conceptually the entire economy is already being captured in the estimates. This implies that there is less concern regarding minor differences in the indicators.

Digital delivery

Most of the examples so far have focused on digital ordering. This is because most business surveys collecting information on the nature of the transaction have focused on digital ordering rather than digital delivery. However, despite the relatively limited focus on mode of delivery in surveys, services being delivered digitally appear to be increasing rapidly over time.

Currently most source data available to national statistical offices to divide the specific columns (imports, exports, household consumption) into digitally delivered and not digitally delivered services are associated with international trade. For instance, trade surveys focusing on mode of supply can be used as a proxy for digital delivery. It could be argued that trade in services via Mode 1, which represents "cross-border supply: from the territory of one country into the territory of another country" (WTO, 2013[52]) is only possible if the service is able to be digitally delivered. Similarly, the concept of ICT-enabled services, defined as "services that are delivered remotely over ICT networks" (UNCTAD, 2015[53]) would appear to be broadly suitable for compiling estimates of digitally delivered services across borders. This concept, which is similar to that of "digitally deliverable" services, can be used as a starting point for estimating aggregate levels of digital deliveries, particularly as they pertain to digitally delivered imports and exports. The Handbook on Measuring Digital Trade elaborates on this and makes a similar recommendation (IMF, OECD, UNCTAD, WTO, 2023[13]).

Transforming business surveys

In response to the Digital SUTs framework and the limited amount of source data on both digital ordering and digital delivery (especially at a more granular level), some countries have undertaken efforts to update relevant business surveys to improve the data available to split transactions by their nature.

For example, the United States Census Bureau has made changes to question wording in its service annual survey to improve the breakdown between digitally ordered transactions direct with the counterparty and those made via a DIP. Following cognitive testing of the e-commerce question, they concluded that "some services respondents were not including certain categories of electronic revenues in their response, such as sales generated from third-party websites and electronic systems other than public-facing websites" (United States Census Bureau, 2018[54]). Therefore, they split the existing question into three questions. This not only improved the coverage of the survey, as responders were made more aware of the different perspectives of e-commerce, but it also allowed for a potential differentiation between transactions direct with counterparties and those that involved a third party such as a DIP. While the results of this split are not published, they allow the producers of these statistics to explore additional analyses and improve quality assurance.

The ONS has added questions to its retail trade survey (see Box 3.1) and completely re-engineered its e-commerce and ICT survey (see Box 3.5). The changes to the e-commerce and ICT survey seek a more granular level of information on a firm's digital activity, including the nature of the transactions for both buying and selling (ONS, 2022[55]). Some of the questions that were added to the survey are presented in Annex 3.D.

Box 3.5. Developing information on the digital economy in the United Kingdom

The United Kingdom's e-commerce and ICT survey was paused in December 2020 to undergo re-development. The development work was linked with a wider initiative to consider the best approach to measuring the digital economy.

Following the pause of the survey in 2020, the team at the ONS launched a wide-reaching user engagement exercise to learn more about the needs of users and policy makers in relation to digital statistics. First, bi-lateral meetings were set up with key stakeholders across government to learn more about their needs for data linked to digital activity to help inform their decision-making. Second, a four-week user engagement exercise was launched to understand the needs of non-government users. The user engagement exercise was launched online and a link to the electronic survey was included in monthly mailouts from the ONS to over 40,000 users.

The consultation work led the ONS to develop a set of over 200 desired outputs. These required a range of data needs, each of which, if implemented, would have equated to individual questions on the redeveloped survey, increasing the survey size by almost four times. A key consideration at this stage was to try and meet the needs of users while not overburdening sampled businesses. Each of the requirements were reviewed, prioritised and reduced by over half to 80 questions in total. Not all the questions that would feature on the re-developed survey were new, as some were carried over from the existing survey or were similar to previous questions. This limited the amount of testing, as only the new questions needed to be cognitively tested.[23]

A small number of United Kingdom businesses were recruited to assist with cognitively testing the new questions. Over 40 recommendations were made, which resulted in some questions being removed as the relevant information could not be provided by respondents. Also, more clarification was added to ensure businesses correctly understood what should be reported.

The key changes made to the old survey include:[24]

- Expanding the survey to collect data on e-commerce purchases.
- More detailed (but still quite high-level) geographical breakdowns of consumers.
- Breakdowns by types of customers: business to business, business to government and business to consumer.
- Breakdowns by goods and services and whether these were digitally or non-digitally ordered and delivered.
- Collecting data on actual values of e-commerce activity instead of percentages.
- Specific questions regarding any interactions with DIPs.

The initial development work up to the point of dispatch spanned 14 months in total and on 28 February 2022 the re-developed and rebranded survey was dispatched. Given the scale of survey changes, the survey was relaunched as the Digital Economy Survey (DES). The DES survey is an annual survey with data collected using an electronic questionnaire from a sample of around 11,000 businesses.

Source: (ONS, 2022[55]).

A similar process has also occurred in the United States for the BEA's survey of direct investment abroad. Unlike the ONS, the BEA took the approach of asking for a percentile range of sales that were digitally ordered or delivered (see Box 3.6). This was designed to re-assure respondents that estimates are acceptable if the required detailed information is not available. Furthermore, since the construction of the Digital SUTs is a re-allocation of existing estimates, rather than a compilation from scratch (a theme that

will be repeated throughout this handbook), percentiles of sales that provide an indication of the level of digital ordering and delivery is sufficient to inform the breakdowns of product rows.

Box 3.6. New questions in the Benchmark Survey of United States Direct Investment Abroad

The BEA's most recent benchmark survey[25] of direct investment abroad, covering direct investment abroad and foreign direct investment in the United States by multinational enterprises (MNEs), was in 2019. Due to the interest in measuring the digital economy, the 2019 benchmark survey included a special section on digital activities on each of the MNE parent ("A") forms and the MNE foreign affiliate ("B") forms, including questions about digitally ordered and digitally delivered sales. The new questions closely followed the definitions in the first edition of the OECD's Handbook on Measuring Digital Trade (OECD, WTO and IMF, 2020[12]).[26]

The survey asked about the percentage of goods and services sales that were digitally ordered and the percentage of services sales that were digitally delivered. Digital ordering was defined as relating to "sales conducted over computer networks by methods specifically designed for the purpose of receiving or placing orders, negotiating terms of sales or price". Digitally delivered services were defined as "those that are delivered remotely over information and communications technology networks". The percentages were collected using checkboxes corresponding to ranges, as shown below.

		Check the appropriate percent range (check one)							The information provided is based on (check one)	
		0%	1–24%	25–49%	50–74%	75–89%	90–99%	100%	Accounting records	Recall/ general knowledge of operations
63	Percentage of sales of services reported in 55 that were **digitally delivered**? 3157	1 1 ☐	1 2 ☐	1 3 ☐	1 4 ☐	1 5 ☐	1 6 ☐	1 7 ☐	2 1 ☐	2 2 ☐
64	Percentage of sales of services reported in 55 that were **digitally ordered**? 3158	1 1 ☐	1 2 ☐	1 3 ☐	1 4 ☐	1 5 ☐	1 6 ☐	1 7 ☐	2 1 ☐	2 2 ☐
65	Percentage of sales of goods reported in 54 that were **digitally ordered**? 3159	1 1 ☐	1 2 ☐	1 3 ☐	1 4 ☐	1 5 ☐	1 6 ☐	1 7 ☐	2 1 ☐	2 2 ☐

Source: (Bureau of Economic Analysis, 2019[56]).

[23] Only new questions were subject to cognitive testing. With hindsight, a limitation of this approach was that the routing and flow of the whole questionnaire was not tested. This will need addressing before the next iteration of the survey is dispatched in 2023.

[24] For a full list of questions asked on the redeveloped survey, see 2021 Digital Economy Survey: Survey Questions (ONS, 2022[66]).

[25] The BEA's two broad survey programs collect data on 1) trade in services, and 2) direct investment and activities of MNEs. The latter of these programs covers direct investment abroad and foreign direct investment in the United States and consists of mandatory quarterly, annual, and benchmark surveys. Benchmark surveys are censuses conducted once every five years that typically cover a broader range of data items than the annual surveys. For example, they may collect more underlying detail on standard financial statement items or may cover special topics.

[26] The full survey forms for United States parents and foreign affiliates can be found on the BEA website.

United States MNE parents are key digital sellers. Therefore, these new survey questions should help providing valuable information for the Digital SUTs on digital ordering of goods and services and digitally delivered services in the United States.

The producer or buyer perspective

National statistical offices are also able to gather relevant information from the other side of the transaction: the people who purchase or receive products digitally. Whereas aggregate information is often obtained from the supply side, product-level information is usually best sourced from the consumer. The household sector is not the only consumer of goods and services ordered digitally, but it is to households that statistical offices most often turn in order to collect additional product level information on e-commerce.

Statistics Canada undertakes the Canadian Internet Use Survey (CIUS) (Statistics Canada, 2021[57]), a specific household survey focusing on how the household sector accesses and uses the internet. While part of the survey, such as the ability to access the internet or average length of time spent online, is not relevant for compiling the Digital SUTs, there is a range of potentially useful outputs from the survey. These include information on the prevalence of online shopping, the amounts and products purchased, as well as whether the purchase was part of a subscription or just one-off. Having this survey in place prior to the COVID-19 pandemic meant that Statistics Canada was able to show how digital ordering had significantly changed due to lockdowns and other COVID-19 related policies (Statistics Canada, 2021[58])

Statistics Sweden has used household surveys to obtain information on the frequency and intensity of digital ordering. Importantly, they have also asked about the products that are being purchased online, allowing for the publication of 24 different product categories (Table 3.5).[27]

Table 3.5. Proportion of online purchases, Sweden, 2021

Goods/services bought/ordered via the Internet, by type of goods/service (% of people purchasing)	2021
Clothes	53
Medicine	34
Furniture, home accessories or garden products	28
Cosmetics, beauty or wellness products	27
Sports goods	24
Deliveries from restaurants, fast-food chains, catering services	23
Physical goods from a private individual	23
Food or beverages from stores or meal-kit providers	22
Printed books, magazines or newspapers	21
Other physical goods	20
Computers, tablets, mobile phones or accessories	18
Consumer electronics or household appliances	16
Cleaning products or personal hygiene products	16
Mobile phone or internet subscriptions	15
Children´s toys and childcare items	13
Bicycles, mopeds, cars, or other vehicles	9
Insurance policies	9
Electricity, water or heating subscriptions	8
Household services	5
Films or series such as DVDs, Blu-ray	3
Tickets to cultural or other events	3

Source: (Statistics Sweden, 2022[59]).

[27] This does not include accommodation and transport services, which are covered with a separate survey that also provides a breakdown of whether a third party was involved in the transaction.

Household surveys offer a level of detail that can be used to break up rows and columns to provide more granular information than is possible from broad-based business surveys. Some categories may need to be combined or used for multiple product rows, as with other indicators on the nature of the transaction. However, they provide a good starting point that allows for preliminary estimates to be created and compared with other source data.

Treatment of digitally ordered retail margins

Most of the source data listed in this chapter has focused on digital ordering or e-commerce associated with the retail industry. However, in the SUTs, the outputs of the retail and wholesale industries cover only their margin activity and not the value of their gross sales. The products being distributed are treated instead as directly purchased by consumers from the industries producing them or from non-residents as imports.

The SUTs' treatment of margins presents challenges for tracking the value of digitally ordered sales and purchases. The first is a lack of information: often while the compiler knows the nature of the final transaction, they may not know how the transaction between producer and retailer occurred. Even if this information is known, because the purchase of a product is only shown on one product row and even if a retailer has added value to it, a decision on how to reflect the two transactions in a single row is required. An assumption may be required, such as treating the final transaction nature as the nature for the entire production process in order to maintain the supply-use equilibrium at both the aggregate and the digitally ordered (and non-digitally ordered) level. While this solution is pragmatic, it may artificially inflate the level of output listed as digitally ordered. The alternative is to try and split the single transaction and show only the retail margin as digitally ordered, and the non-retail components as non-digitally ordered. Not only would this be very difficult to achieve; it would also alter the existing treatment of retail margins in the conventional SUTs.

A different presentation, adopted in the Canadian Digital SUTs, shows the full value of digitally ordered purchases from distributors. However, the equivalent supply of the non-margin value allocated to domestic industries producing the products is shown under "Digitally ordered via a resident retailer or wholesaler" to separately track these activities (Table 3.6). Box 3.7 provides a more detailed explanation of the options available and Figure 3.7 shows a numerical example.

Table 3.6. Digital supply table, Canada, 2019

Nature of the transaction	Output, all industries Million Canadian dollars
Total	4,065,386
Digitally ordered	277,933
• Direct from a counterparty	218,757
• Via a resident digital intermediary	1,193
• Via a non-resident digital intermediary	3,839
Via a resident retailer or wholesaler	54,144
Not digitally ordered	3,787,453

Source: (Statistics Canada, 2021[29]).

Box 3.7. The recording of digital ordering involving retail margins

To Illustrate the different options available to compilers for recording digital ordering involving retailers and wholesalers, Figure 3.7 displays the three recording treatments proposed. Since the high priority indicators focus on expenditure split by the nature of the transaction for household consumption, it is considered useful to specifically address the different recording options involving retailers.

In the example shown, the manufacturing industry produces $150 worth of shoes; $50 worth of these shoes are sold direct to the consumer through digitally ordering, $100 worth of these shoes are sold to a retailer, who resells at $120, thereby adding a retail margin of $20. Of the shoes sold via the retailer, 25% or $30 are sold via digital ordering.

Option 1 sees the nature of the final transaction as dictating the digital/non-digital split for the entire production process. The digital ordering of $50 direct to the producer as well as the $30 to the retailer are considered as digital ordering. This approach ignores the nature of the transaction between the producer and the retailer resulting in total digital ordering worth $80 and non-digital ordering worth $90. If information on the nature of the transaction is taken from household surveys, then this would appear the most likely treatment as data from households is usually provided for the value of the entire purchase not just the retail component. Since the digital/non-digital split on the supply side must equal that on the use side, the final consumption expenditure of shoes on the use table shares the $80/$90 digital/non-digital split. It could be argued that this overstates the value of digitally ordering in the economy as the it implies that every transaction in the production process mirrors the nature of the final transaction.

Option 2 attempts to break up the value of the product between the retail margin and non-margin components. This would allow for the value of the product to be applied appropriately while separately recording the digital/non-digital split as it pertains to the retail margin. Not only would this information be incredibly difficult to assign to many different products flowing through retailers, it would also go against the fundamental SUT framework where the output of the retail industry is considered a margin and added to the price of the existing product rather than being consumed directly. For this reason, this option is not recommended.

Option 3 represents the alternative undertaken by Statistics Canada in their representation of the Digital SUTs. It builds on Option 1, but rather than automatically representing the value digitally ordered via the retailer as equal to the directly digitally ordered component, it sees the supply (and the subsequent consumption) as being done via a retailer. While the overall output and consumption split is still the same as Option 1 at $80-digital, $90-non-digital, $30 of this value is clearly shown to have be done via a retailer. This can signal to the reader that the digital/non-digital splits for prior transactions in this processing chain are unknown, unlike in the case of Option 1 where $50 was directly digitally ordered from the producer.

The choice between Option 1 and Option 3 will probably depend on different factors including source data availability, the level of B2B and B2C digital ordering and user preference. While Option 3 provides additional information to the users, not every B2B transaction is able to be fully represented in the production process of every product.

Figure 3.7. Numerical example of recording options for retail margins

Option 1: Final transaction dictates digital split for entire production process

SUPPLY	Output (basic price)	Trade margin	Supply at purchasers price	Total output	
				Digitally ordered	Not digitally ordered
Manufacturing industry - Shoes	150	20	170	80	90
Retail industry	20	-20	0	0	0

USE	Final Consumption Expenditure	
	Digitally ordered	Not digitally ordered
Manufacturing industry - Shoes	80	90

Option 2: Separate retail margin between digital and non-digital

SUPPLY	Output (basic price)	Trade margin	Supply at purchasers price	Total output	
				Digitally ordered	Not digitally ordered
Manufacturing industry - Shoes	150	20	170	80	90
Retail industry	20	-20	0	5	15

USE	Final Consumption Expenditure	
	Digitally ordered	Not digitally ordered
Manufacturing industry - Shoes	50	100
Retail	5	15

Option 3: Indentify amount ordered by retailers and wholesalers

SUPPLY	Output (basic price)	Trade margin	Supply at purchasers price	Total output	
				Digitally ordered	Not digitally ordered
Manufacturing industry - Shoes	150	20	170	80	90
Direct from counter party	50	0	50	50	0
Via retailers	100	20	120	30	90
Retail industry	20	-20	0	0	0

USE	Final Consumption Expenditure	
	Digitally ordered	Not digitally ordered
Manufacturing industry - Shoes		
Direct from counter-party	50	0
Via retailers	30	90

Source: The authors.

Option 3 provides greater insight into whether the expenditure is definitively digitally ordered or potentially digitally ordered. While it does create an extra row and thus extra calculations, it would appear easier to implement such a solution than trying to divide the gross purchase into a retail and non-retail components. It is also more consistent with the existing SUT treatment. It is therefore seen as a useful approach that could be considered by countries, especially for the rows containing aggregates and totals.

Conclusion

This chapter has looked at the nature of the transaction, which is the foundation of the Digital SUTs. It includes the differentiation of the supply and use of products based on how the product is ordered, and the separation of totals - such as final consumption and imports – into the parts that are digitally delivered and the part that are not.

Such breakdowns are of interest to policy makers because they show which products are experiencing the largest disruptions in the producer-consumer paradigm as the importance of the digital economy grows. They may also provide an indication of which economic activities might relocate across borders if service delivery became fully digital (not physical).

Compilation challenges such as a lack of data on digitally delivered services and digitally ordered estimates at the product level, still exist; but many countries already have some data available. On top of the data already available, several countries have undertaken steps to develop source data in this area. The success of these efforts should be monitored so that other countries can replicate success stories and learn from initial challenges as faced by some countries.

Annex 3.A. List of products considered digitally deliverable

Annex Table 3.A.1. List of products considered digitally deliverable

CPC 2.1 product codes	CPC 2.1 Products
611	Wholesale trade services, except on a fee or contract basis
A612	Wholesale trade services on a fee or contract basis
621	Non-specialised store retail trade services
622	Specialised store retail trade services
623	Mail order or internet retail trade services
624	Other non-store retail trade services
625	Retail trade services on a fee or contract basis
69112	Electricity distribution (on own account)
692	Water distribution (on own account)
7111	Central Banking services
7112	Deposit services
7113	Credit-granting services
7114	Financial leasing services
7119	Other financial services, except investment banking, insurance services and pension services
712	Investment banking services
71311	Life insurance services
71312	Individual pension services
71313	Group pension services
7132	Accident and health insurance services
71331	Motor vehicle insurance services
71332	Marine, aviation and other transport insurance services
71333	Freight insurance services
71334	Other property insurance services
71335	General liability insurance services
71336	Credit and surety insurance services
71337	Travel insurance services
71339	Other non-life insurance services
714	Reinsurance services
715	Services auxiliary to financial services other than to insurance and pensions
7161	Insurance brokerage and agency services
7162	Insurance claims adjustment services
7163	Actuarial services
7164	Pension fund management services
7169	Other services auxiliary to insurance and pensions
717	Services of holding financial assets
7212	Trade services of buildings
722	Real estate services on a fee or contract basis
73220	Leasing or rental services concerning video tapes and disks
73311	Licensing services for the right to use computer software
73312	Licensing services for the right to use databases
7332	Licensing services for the right to use entertainment, literary or artistic originals

CPC 2.1 product codes	CPC 2.1 Products
611	Wholesale trade services, except on a fee or contract basis
7333	Licensing services for the right to use R&D products
73340	Licensing services for the right to use trademarks and franchises
7335	Licensing services for the right to use mineral exploration and evaluation
7339	Licensing services for the right to use other intellectual property products
811	Research and experimental development services in natural sciences and engineering
812	Research and experimental development services in social sciences and humanities
813	Interdisciplinary research and experimental development services
814	Research and development originals
821	Legal services
822	Accounting, auditing and bookkeeping services
823	Tax consultancy and preparation services
824	Insolvency and receivership services
8311	Management consulting and management services
8312	Business consulting services
8313	IT consulting and support services
83141	IT design and development services for applications
83142	IT design and development services for networks and systems
83143	Software originals
8315	Hosting and IT infrastructure provisioning services
8316	IT infrastructure and network management services
8319	Other management services, except construction project management services
832	Architectural services, urban and land planning and landscape architectural services
833	Engineering services
8342	Surface surveying and map-making services
8343	Weather forecasting and meteorological services
8344	Technical testing and analysis services
836	Advertising services and provision of advertising space or time
837	Market research and public opinion polling services
83811	Portrait photography services
83812	Advertising and related photography services
83814	Specialty photography services
83815	Restoration and retouching services of photography
83815	Restoration and retouching services of photography
83819	Other photography services
8382	Photographic processing services
83911	Interior design services
83912	Industrial design services
83919	Other specialty design services
8392	Design originals
8393	Scientific and technical consulting services n.e.c.
8394	Original compilations of facts/information
8395	Translation and interpretation services
8396	Trademarks and franchises
8399	All other professional, technical and business services, n.e.c.
8399	All other professional, technical and business services, n.e.c.
841	Telephony and other telecommunications services
842	Internet telecommunications services
84311	On-line books
84312	On-line newspapers and periodicals
84313	On-line directories and mailing lists

CPC 2.1 product codes	CPC 2.1 Products
611	Wholesale trade services, except on a fee or contract basis
8432	On-line audio content
8433	On-line video content
8434	Software downloads
84391	On-line games
84392	On-line software
84393	On-line adult content
84394	Web search portal content
84399	Other on-line content n.e.c.
844	News agency services
845	Library and archive services
8461	Radio and television broadcast originals
8462	Radio and television channel programmes
84631	Broadcasting services
84632	Home programme distribution services, basic programming package
84633	Home programme distribution services, discretionary programming package
84634	Home programme distribution services, pay-per-view
851	Employment services
8521	Investigationservices
8522	Security consulting services
855	Travel arrangements, tour operator and related services
8591	Credit reporting services
8592	Collection agency services
8593	Telephone-based support services
8594	Combined office administrative services
8595	Specialised office support services
8596	Convention and trade show assistance and organization services
8599	Other information and support services n.e.c.
86312	Support services to electricity distribution
8713	Maintenance and repair services of computers and peripheral equipment
891	Publishing, printing and reproduction services
921	Pre-primary education services
922	Primary education services
923	Secondary education services
924	Post-secondary non-tertiary education services
925	Tertiary education services
92911	Cultural education services
92912	Sports and recreation education services
92919	Other education and training services, n.e.c.
92919	Other education and training services, n.e.c
9292	Educational support services
931	Human health services
961	Audiovisual and related services
963	Services of performing and other artists
96511	Sports and recreational sports event promotion services
969	Other amusement and recreational services
96921	On-line gambling services

Source: Adapted from (IMF, OECD, UNCTAD, WTO, 2023[13]).

Annex 3.B. Digital trade framework and the Handbook on Measuring Digital Trade

The framework for measuring digital trade

Over the last twenty years, a number of measurement initiatives have emerged in the area of digital trade, including the work of OECD and the United Nations Conference on Trade and Development (UNCTAD) on defining and measuring e-commerce, UNCTAD's work on ICT-enabled trade and the OECD's Going Digital Project (OECD, 2023[60]). On the policy front, the World Trade Organisation (WTO)'s Work Programme on Electronic Commerce, established in 1998, defines e-commerce as the "*production, distribution, marketing, sale or delivery of goods and services by electronic means*" (WTO, 1998[61]). More recently, the work of López-González and Jouanjean (López González and Jouanjean, 2017[62]) proposed a framework for digital trade for trade policy analysis, in which all digitally enabled transactions are considered to be in scope for digital trade.

The first edition of the Handbook on Measuring Digital Trade (OECD, WTO and IMF, 2019) formalised for the first time a *statistical* definition of digital trade, combining the two key criteria of digital ordering and digital delivery: "*digital trade is all international trade that is digitally ordered and/or digitally delivered*". This statistical definition reflects the multidimensional character of digital trade by identifying the nature of the transaction as its defining characteristic. It is the basic building block of a conceptual measurement framework, which is fully consistent with macroeconomic accounts.

The nature of the transaction – digitally ordered and/or digitally delivered – is the overarching defining characteristic of digital trade, i.e. it is *how* the transaction is conducted that determines the scope of digital trade. However, the framework also includes two other dimensions crucial for trade policy purposes: the product dimension (*what is traded*) and the actors engaged in digital trade (*who is trading*). The second edition of the Handbook on Measuring Digital Trade (IMF, OECD, UNCTAD, WTO, 2023[13])provides clarifications to the concepts and definitions introduced in the first edition, and to the guidelines on how to operationalise them. It also builds on national experiences and best practices to expand compilation guidance.

Digital trade transactions are a subset of existing trade transactions, as measured in international merchandise trade statistics and in international trade in services statistics. Any economic actor can engage in digital trade. The accounting principles for recording digital trade follow those defined in the International Merchandise Trade Statistics Concepts and Definitions (United Nations, 2011[63]), the Manual on Statistics of International Trade in Services (United Nations et al, 2010[64]) and the Balance of Payments (IMF, 2009[65]). Although international trade statistics should, in principle, cover digital trade, digital ordering and delivery, some of the known measurement challenges involved in recording international transactions are exacerbated in the case of digital trade. One reason is that digitalization increases the involvement of small firms and households in international trade, and this involvement may not be adequately covered by traditional data sources, which are often reliant on large firms. Also the rise in digital ordering has led to an increase in low-value trade in goods, which may elude methods of tracking merchandise trade based on value thresholds. For some transactions, the involvement of digital intermediation platforms (DIPs) compounds the difficulties by adding a third party.

To overcome these challenges, it is necessary to reconsider the existing data sources in terms of their coverage and accuracy, not only to develop digital trade statistics, but also to improve the measurement

of international trade in general. The Handbook on Measuring Digital Trade recommends building on and combining existing data sources with a view to producing comprehensive digital trade statistics.

Digital trade concepts

In line with the OECD definition of e-commerce (OECD, 2011), digitally ordered trade is defined in the Handbook on Measuring Digital Trade as "the international sale or purchase of a good or service, conducted over computer networks by methods specifically designed for the purpose of receiving or placing orders". Digitally ordered trade is therefore synonymous with international e-commerce and covers transactions in both goods and services.

Digitally delivered trade is defined in the handbook as "all international trade transactions that are delivered remotely over computer networks". The handbook takes the view that only services can be digitally delivered. Unlike digital ordering, which is instantaneous, digital delivery can take place over a longer period and can involve a significant degree of inter-personal interaction. Crucial to the definition is that such interaction occurs remotely through computer networks.

DIPs are defined in the handbook as "online interfaces that facilitate, for a fee, the direct interaction between multiple buyers and multiple sellers, without the platform taking economic ownership of the goods or rendering the services that are being sold (intermediated)". The service provided by DIPs is that of "matching" buyers with sellers and thus facilitating the exchange of goods or the provision of services. These digital intermediation services (DIS), which are, by definition, both digitally ordered and digitally delivered, are defined as "online intermediation services that facilitate transactions between multiple buyers and multiple sellers in exchange for a fee, without the online intermediation unit taking economic ownership of the goods or rendering the services that are being sold (intermediated)".

To record transactions facilitated by DIPs, it is necessary to distinguish the supply of goods or services (i.e. the transaction between the seller and the buyer) from the provision of intermediation services (i.e. the transaction between the DIP and both the seller and the buyer). Regardless of whether a given DIP facilitates transactions in goods or services, the intermediation fees should be recorded under trade-related services in the international accounts.

Reporting digital trade transactions

The Handbook on Measuring Digital Trade proposes a reporting template which supports the compilation of the two components of digital trade – digitally ordered trade and digitally delivered trade – as well as the calculation of total digital trade. The template allows the different components to be measured in the way that best suits the compiler, even when only partial information is available.

Annex Table 3.B.1. Reporting template for digital trade

Item			Total exports	Total imports
1	Total digital trade	2+3 minus 4		
2	Digitally ordered trade	2.1+2.2		
2.1	Goods			
2.1.a	*of which: via DIPs*			
2.2	Services			
2.2.a	*of which: via DIPs*			
3	Digitally delivered trade			
3.a	*of which: via DIPs*			
4	Digitally ordered *and* digitally delivered trade			
4.a	*of which: digital intermediation services*			
	Addendum items			
A.1	Digital trade in services	2.2+3 minus 4		
A.2	Digitally deliverable services	>3		

Note: Transactions should be broken down by relevant product groupings: Extended Balance Of Payments Service Classification (EBOPS) 2010 for services and, for example, the Harmonized Commodity Description and Coding System (HS) or the Central Product Classification (CPC) for goods. Annex B of the Handbook on Measuring Digital Trade provides examples to guide compilers in using the reporting template to record digital trade transactions.
Source: (IMF, OECD, UNCTAD, WTO, 2023[13]).

For a comprehensive measure of total digital trade, it is important to develop data sources that can measure digitally ordered trade and digitally delivered trade and can also identify trade that is both digitally delivered and digitally ordered. ICT usage surveys (for both businesses and households) are well placed to measure this overlap. To this end, surveys should collect information on sales and purchases broken down by goods, digitally delivered services, and other services.

Annex 3.C. Eurostat's community survey on ICT usage and e-commerce in enterprises

Eurostat has continually refined its ICT survey and now has a specific module focusing on e-commerce. The survey asks not only the dollar amount or percentage of sales that were made via e-commerce but also includes many additional splits that can be useful for the compilation of the Digital SUTs.

Examples of these splits include between the producer's own web site, marketplace apps or Electronic Data interchange (EDI) sales; whether the sales are B2B or B2C; and the geographical location of customers (Domestic, EU or Non-EU).

Examples of survey questions within Eurostat's survey on ICT usage and e-commerce in enterprises

What was the percentage breakdown of the value of web sales in 2020 for the following:

(Please refer to value of web sales you reported in B2)

If you cannot provide the exact percentages an approximation will suffice.

a) via your enterprise's websites or apps? (including extranets)	⊔ ⊔ ⊔ %
b) via e-commerce marketplace websites or apps used by several enterprises for trading goods or services? (e.g. e-Bookers, Booking, hotels.com, eBay, Amazon, Amazon Business, Alibaba, Rakuten, TimoCom etc.) *[Please add national examples of e-commerce marketplaces incl. government marketplaces]*	⊔ ⊔ ⊔ %
TOTAL	**1 0 0 %**

What was the percentage breakdown of the value of web sales in 2020 by type of customer:

(Please refer to value of web sales you reported in B2)

If you cannot provide the exact percentages an approximation will suffice.

a) Sales to private consumers (**B2C**)	⊔ ⊔ ⊔ %
b) Sales to other enterprises (**B2B**) and Sales to public sector (**B2G**)	⊔ ⊔ ⊔ %
TOTAL	**1 0 0 %**

B8. *11

What was the percentage breakdown of the value of web sales in 2020 to customers located in the following geographic areas?

(Please refer to value of web sales you reported in B2)

If you cannot provide the exact percentages an approximation will suffice.

a) Own country	␣ ␣ ␣ %
b) Other EU countries	␣ ␣ ␣ %
c) Rest of the world	␣ ␣ ␣ %
TOTAL	**1 0 0 %**

Source: (Eurostat, 2021[44]).

Annex 3.D. Selected questions from the ONS's Digital Economy Survey

E-commerce sales

1. During 2021, did this business make any e-commerce sales?
2. During 2021, what was your business's turnover from e-commerce sales?
3. Of the value of turnover from e-commerce sales, what was the value of each of the following?
   - Turnover from e-commerce sales via business's own website, app, or EDI
   - Turnover from e-commerce sales via a digital intermediary platform
4. During 2021, did your business make any e-commerce sales to customers located in the UK?
5. During 2021, what was your business's turnover from e-commerce sales to customers located in the UK?
6. During 2021, what type of e-commerce sales did your business make to customers located in the UK?
   - Sales of goods
   - Sales of digitally delivered services
   - Sales of non-digitally delivered services
7. How much of the value of the turnover from e-commerce sales to customers located in the UK came from the following?
   - Turnover from e-commerce sales of goods
   - Turnover from e-commerce sales of digitally delivered services
   - Turnover from e-commerce sales of non-digitally delivered services

E-commerce purchases

1. During 2021, did this business make any e-commerce purchases?
2. During 2021, what was your business's expenditure on e-commerce purchases?
3. During 2021, what type of e-commerce purchases did your business make from suppliers located in the UK?
   - Purchases of goods
   - Purchases of digitally delivered services
   - Purchases of non-digitally delivered services
4. How much of the value of expenditure on e-commerce purchases from suppliers located outside the UK, was spent on each platform?
   - Expenditure on e-commerce via a business's website or app
   - Expenditure on e-commerce purchases via other platforms
   - Expenditure on purchases of ICT goods
   - Expenditure on purchases of cloud services

- Expenditure on purchases of digital intermediary services
- Expenditure on purchases of other digital services

Digital intermediary platform

1. During 2021, did this business provide a digital intermediary platform service?
2. During 2021, what was your business's income from fees charged to the following users of your digital intermediary platform?
   - Income from fees charged to users located in the UK
   - Income from fees charged to users located outside the UK
3. During 2021, what was the value of goods sold through your platform to each of the following?
   - Value of goods sold to customers located in the UK
   - Value of goods sold to customers located outside the UK
4. During 2021, what was the value of services sold through your platform to each of the following?
   - Value of services sold to customers within the UK
   - Value of services sold to customers outside the UK
5. During 2021, did your business pay a digital intermediary platform to sell your goods and services?
6. During 2021, how much did your business pay to a digital intermediary platform to sell your goods and services?

Source**:** (ONS, 2022[66]).

4 Digital products (the “what”)

This chapter describes the Digital Supply and Use Tables (SUTs) framework from the product perspective. Estimates for the production and final demand of Information and Communication Technology (ICT) goods and digital services illustrate how digitalisation is changing production processes and consumption habits. This chapter also defines two digital products that are of particular policy interest - cloud computing services and digital intermediation services - and discusses the challenges of compiling estimates for them.

Introduction

The previous chapter (Chapter 3) discussed the transaction perspective (the "how") within the Digital Supply and Use Table (Digital SUT) framework that was presented in Chapter 2. This chapter discusses the product perspective (the "what"). It proposes new totals and breakdowns to provide visibility of the impact that digital products have in the economy.

Except for two separately identified digital products, the Digital SUT aggregates all **Information and Communication Technology (ICT) goods** into one row and all **digital services** into another row. This provides straightforward indicators of the importance of digitalisation to production processes and growth in consumption of these products over time.

Two products, **digital intermediation services (DIS)** and **cloud computing services (CCS)** are separately identified, reflecting the fundamental role these products play in the digitalised production and value chains of both traditional industries and the new digital industries. The addition of these rows means that indicators associated with products in the conventional SUTs (such as intermediate and final consumption, import, exports etc.) can be generated for DIS and CCS specifically, as well as for the totals of **ICT goods** and of **digital services**.

This chapter examines each of these additional rows (ICT goods, digital services, DIS and CCS), providing more information on the definition of the specific products and aggregations. It also provides guidance on how countries can compile product-based estimates consistent with the Digital SUT framework.

ICT goods and digital services

Definition of ICT goods and digital services in the Digital SUTs

The product rows ICT goods and digital services are discussed together because the genesis of both rows is the same: the ICT product classification found in the Central Product Classification (CPC) Version 2.1, Part 5: Alternative structures (UNSD, 2015[25]). The goods and services included in this alternative ICT product classification (and thus in the rows of the Digital SUTs) consist of products that "must primarily be intended to fulfil or enable the function of information processing and communication by electronic means, including transmission and display" (UNSD, 2015[25]). The classification includes both goods and services, but there is a split between ICT goods and digital services.

The row covering ICT goods within the Digital SUTs includes four types of ICT goods:

1. Computers and peripheral equipment;
2. Communication equipment;
3. Consumer electronic equipment; and
4. Miscellaneous ICT components and goods.

The row covering digital services includes the following broad categories:

1. Manufacturing services for ICT equipment;
2. Business and productivity software and licensing services;
3. Information technology consultancy and services;
4. Telecommunications services;
5. Leasing or rental services for ICT equipment; and
6. Other ICT services.

Detailed lists of the lower-level products included in these categories is provided in Annex 4.A.

These product rows correspond to the ICT sector in the International Standard Industrial Classification of All Economic Activities (ISIC) (UNSD, 2008[24]). They can be used as the basis for the digitally enabling industry outlined within the industry perspective of the Digital SUT framework (see Chapter 5).

The concept of a digital good or service is evolving. It should be considered independently of the nature of the transaction used to order or deliver it. Although many digital services must be delivered digitally, the fact that a service is delivered or ordered digitally does not automatically make that service a digital service. Some services such as publishing, gambling or education are increasingly being delivered digitally and the Digital SUT framework allows this change to be represented based on the nature of the transaction (see Chapter 3). However, rather than having a growing list of (potential) digital services, the Informal Advisory Group (IAG) on Measuring GDP in a Digitalised Economy took the decision to use the established classification within the CPC.

Why separately identifying ICT goods and digital services is important

Although the Digital SUT framework does not subscribe to the idea of a single definition of the digital economy and the Digital SUT framework allows for the digital economy to extend beyond the ICT sector, it is clear that many users and analysts consider ICT products as a fundamental component. Several definitions consider the digital economy to consist of "the effective use of information and communication technology (ICT)" (G20 DETF, 2016[67]) or "economic activities enabled by information and communication technologies (ICT)" (Pratt, 2016[68]). Even if not considered a proxy for the digital economy, it can be useful to separately identify these products for several reasons. By separating out ICT products, it is possible to track their growth and how they may be replacing the consumption of more traditional products in production as well as final consumption by households. Also, the link between ICTs and growth of value added and productivity has been established through a body of economic research (Spiezia, 2012[69]; Cette, Nevroux and Py, 2020[70]). Therefore, policy makers are keen to have more information on this trend.

Such insights and references have largely been made possible by the (relatively) neat and well-established delineation of ICT goods and digital services in economic statistics. In addition to there being a separate aggregate in the CPC, their use is consistent with the overall asset definition in the System of National Accounts (SNA).[28] The SNA lists ICT Equipment and Computer Software as separate classes of fixed assets. Many countries are already publishing outputs related to this classification, so the inclusion of this aggregate within the Digital SUT framework appears quite achievable.

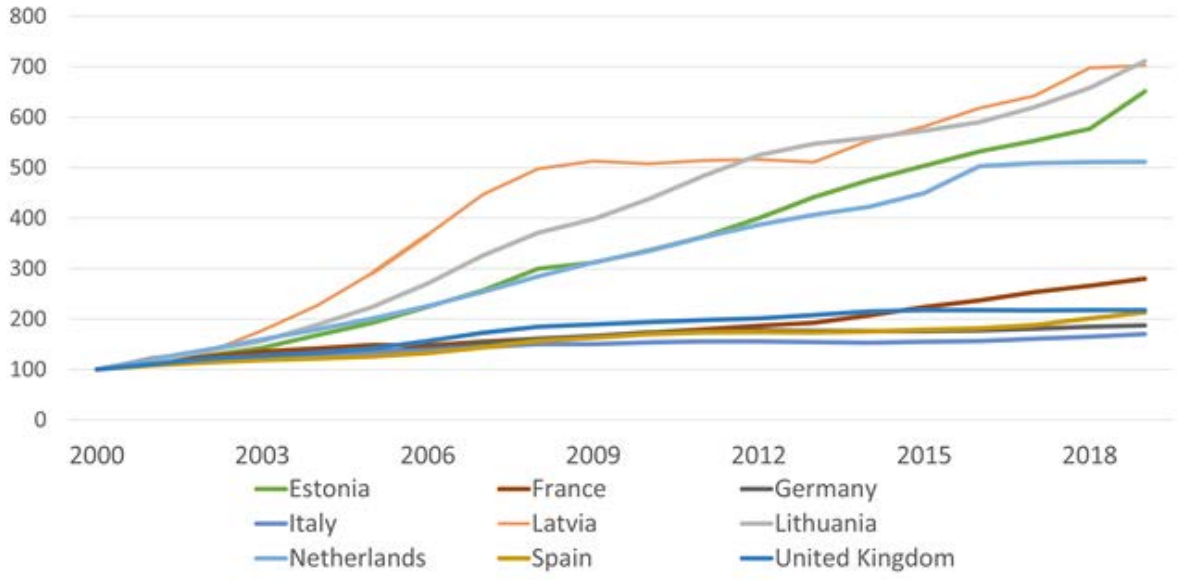
[28] This overriding definition of an asset is if the "goods and services are used in production for more than one year" (SNA §10.33) (UNSD, Eurostat, IMF, OECD, World Bank, 2009[18]).

The established nature of the ICT product classification is reflected in the long time series that countries have available on investment in ICT Equipment as defined in the 2008 SNA. This definition is not as broad as the ICT goods and digital services aggregate included in the Digital SUTs, as it is limited to just equipment or, more specifically, "devices using electronic controls and also the electronic components forming part of these devices" (UNSD, Eurostat, IMF, OECD, World Bank, 2009[18]); but it shows that a lot of countries have detailed information available. The data shows an increase in investment in these goods over time (Figure 4.1), with most countries at least doubling the volume of investment in the past 15-20 years.

It is important to note that businesses are not just investing in ICT goods to leverage the digital transformation; they are also consuming more digital services in their everyday production processes. The multidimensional nature of the SUTs is useful to understand what products business are consuming. For example, the Digital SUTs are able to show the level of ICT goods and digital services being recorded as intermediate consumption by conventional industries in the production of non-digital goods and services.

Figure 4.1. Gross Fixed Capital Formation, ICT Equipment, selected OECD countries

Index (2000 = 100)



Source: (OECD, 2022[71]).

Measuring ICT goods and digital services

Since all of the products listed in the CPC ICT goods and digital services classification are already included in existing products, expenditure on these products is already captured in most existing economic business surveys that ask for information on products used in consumption. Normally, surveys asking for this type of information are undertaken on an annual basis. Therefore, much of the information required to populate the ICT goods and digital services rows is already being captured by national statistical offices and compilation of these rows becomes an exercise in separating out the ICT goods and digital services from other products.

In addition to the existing surveys, recent changes to business surveys initiated by the United Kingdom Office for National Statistics (ONS) in their Digital Economy Survey (See Chapter 3) has led to the

inclusion of specific questions on the purchase of digitally delivered services by businesses (ONS, 2022[66]). Examples include:

- What type of e-commerce purchases did your business make from suppliers located in the UK?
  - Purchases of goods.
  - Purchases of digitally delivered services.
  - Purchases of non-digitally delivered services.
- What was your business's expenditure on digitally delivered services from suppliers located outside the UK?

Similar questions are asked in the Canadian Survey of Digital Technology and Internet Use, which asks firms for a breakdown of the type of goods or services ordered over the internet, specifically asking for a separation between those goods and services that were digitally delivered and "other services" (Statistics Canada, 2022[72]).

Neither the United Kingdom nor Canadian survey asks specifically for purchases of the products listed in the CPC classification, and digital service products as defined in the ICT CPC classification and services that can be "digitally delivered" are not exactly the same. However, many of the service products listed in the classification are only able to be delivered digitally (network management, website hosting and the entire telecommunications category). As such, the inclusion of questions such as these would assist countries in breaking up the existing product rows in order to create the aggregate rows of ICT goods and digital services.

The level of ICT goods and services provides a simple metric that can be reproduced across countries. A recent joint exercise between the OECD and the United States Bureau of Economic Analysis (BEA) showed that in the United States, certain industries have observed significant increases over the past 10-15 years in their consumption of ICT goods and digital services (see Chapter 6), regardless of the final product the industry was creating.

Cloud computing services

Definition of cloud computing services in Digital SUTs

The first step in appropriately measuring cloud computing services[29] (CCS) is to clearly identify what it is. In this regard, the definition of CCS has continued to develop as new products associated with cloud technology became available, expanding the scope of cloud computing.

In 2014, the OECD provided a high-level definition of cloud computing as "a service model for computing services based on a set of computing resources that can be accessed in a flexible, elastic, on-demand way with low management effort" (OECD, 2014[73]). This definition is useful in setting out that cloud computing involves the provision of computing services using computing resources that can be accessed and scaled flexibly, in other words "on-demand". However, this definition does not make clear the nature of the access, which occurs over networks (mostly the internet), or the types of resources

[29] In this handbook, "cloud computing", "cloud services", and "cloud computing services" are treated as having the same meaning. In some conceptualisations, "cloud computing" is framed as the subset of cloud services in which cloud computers are used to perform computational tasks. In this way, software-as-a-service applications are a form of cloud computing. In that view, services such as cloud storage are outside the scope of cloud computing as they are mainly "passive" rather than focused on "active" computation. Nevertheless, cloud storage involves the provision of network connectivity, data storage and indeed some processing power so are considered the same product in the Digital SUT.

accessed (such as networking, storage and computer processing power). The definition was expanded upon in a guidance note covering CCS prepared as part of the update of the 2008 SNA led by the Inter Secretariat Working Group on National Accounts (ISWGNA). This contained the following definition, which will be used for the Digital SUT framework:

> *"Cloud computing services consist of computing, data storage, software, and related IT services accessed remotely over a network, supplied on demand and with measured resource usage that allows charging on a pay-per-use basis" (ISWGNA, 2022[74]).*

On-demand delivery is a defining aspect of cloud products. Access over a network alone is not sufficient for a service to be considered CCS. With on-demand delivery, a cloud service user can obtain the computing resources they require over the network and without the need for manual intervention on the part of the cloud services provider. Furthermore, the volume of computing power and data storage they have access to is practically unlimited because of the flexible and elastic nature of cloud services arising from pooling ICT resources across multiple users.

An additional interpretation consideration involves the exact meaning of "on-demand". The 2008 SNA update guidance note suggests that *"services delivered under contracts for a fixed period of access, such as a year, are ordered in advance, not supplied "on-demand." Software subscriptions, for example, involve a license to access the software over a fixed time period"* (ISWGNA, 2022[74]). However, although some CCS are billed based directly on usage,[30] others, such as data storage, are usually billed based on the customer having access to a certain amount of resources over a given billing period (e.g. a month or a year). The customer is free to use as much or as little of the purchased capacity as they wish and, importantly, can usually add additional capacity rapidly if needed.

This type of pricing may not be precisely usage-based as specified in the definition. However, since the business is undertaking the same fundamental outsourcing of hardware and software, ideally the economic statistics should reflect this. Therefore, expenditure that reduces investment in favour of flexible, on-demand hardware and software accessed remotely is considered as CCS. With the evolution of both technology and pricing structures, compilers will need to make judgement calls on when a product does or does not meet the definition of CCS. As countries begin to undertake more measurement of CCS, that some of these challenges will continue to be discussed and reporting conventions are likely to emerge.

The definition outlined above excludes services related to co-location. This practice consists of placing firms' hardware, such as their servers, in a common location in order to leverage some collective technological advantages such as increased network security, improved connectivity, or reliability of power supply without undertaking a full cloud migration. As pointed out in the SNA update guidance note, the servers (or other hardware) are still owned by the firms that use them, and therefore such co-location falls outside the definition of CCS; instead, it should be treated in the same way as conventional capital investment (ISWGNA, 2022[74]).

Why separately identifying cloud computing services is important

The use of CCS is growing across industries. Businesses can derive significant benefits from the flexibility that comes with "on-demand access, over the internet, to ICT resources, such as computing power, data storage capacity, operating system functionality, and software applications" (Baer, Lee and Tebrake, 2020[75]). Figure 4.2 shows that between 2014 and 2020, the use of cloud computing by

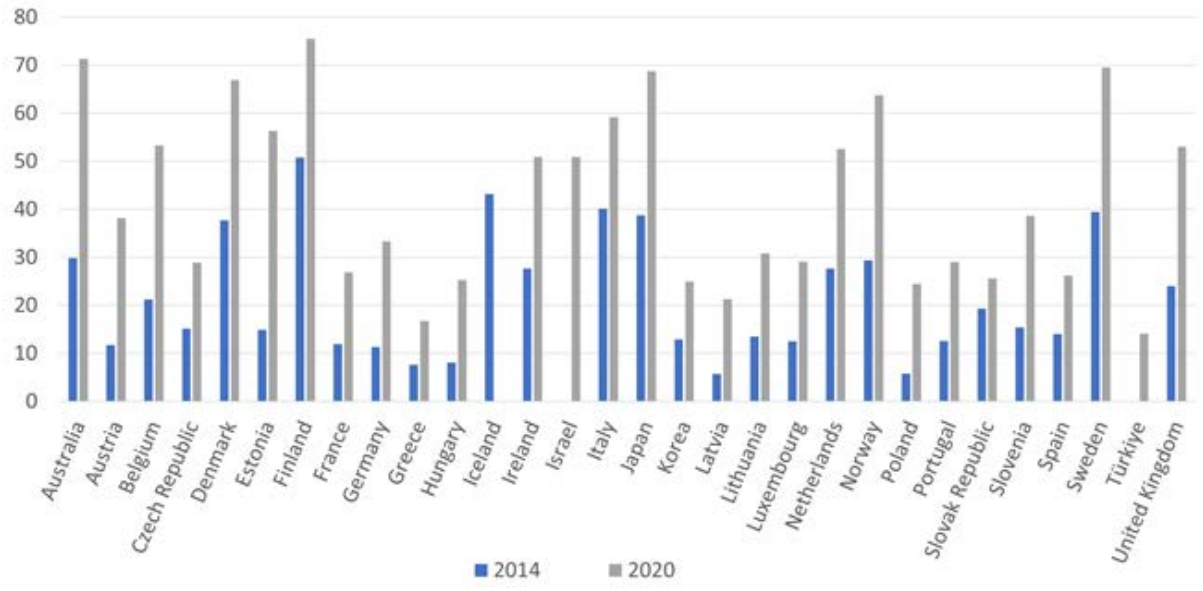
[30] For example, cloud computing capacity may be billed for each second during which a user is running their code (although often a minimum charge of 60 seconds or 1 hour may apply).

businesses has grown in every OECD country for which data is available, doubling in more than half of the countries. It is important to be able to measure the changes taking place and analyse their impacts on economic growth and productivity.

Some of the growing preference for CCS can be explained by the cost saving that can be achieved by businesses, since cloud computing providers are able to leverage the gap between the low utilisation rate of on-premises servers and software on the one hand, and the high utilisation rate that cloud computing data centres can achieve by taking advantage of scale of economies and virtualisation on the other hand (Cisco, 2018[76]).

Figure 4.2. Proportion of businesses purchasing cloud computing services, OECD countries

% of businesses



Note: All business with 10 employees or more.
Source: (OECD, 2022[77]).

From a production function point of view, the expenditure on CCS is not just another input cost that needs to be measured, rather it is a fundamental shift from the traditional model of ICT provision, in which firms directly invest in ICT hardware, software, and complementary specialist labour, to a model where such services are provided by external companies.

The IMF (Baer, Lee and Tebrake, 2020[75]) identified a range of economic impacts that can be expected as an increasing share of firms take up CCS:

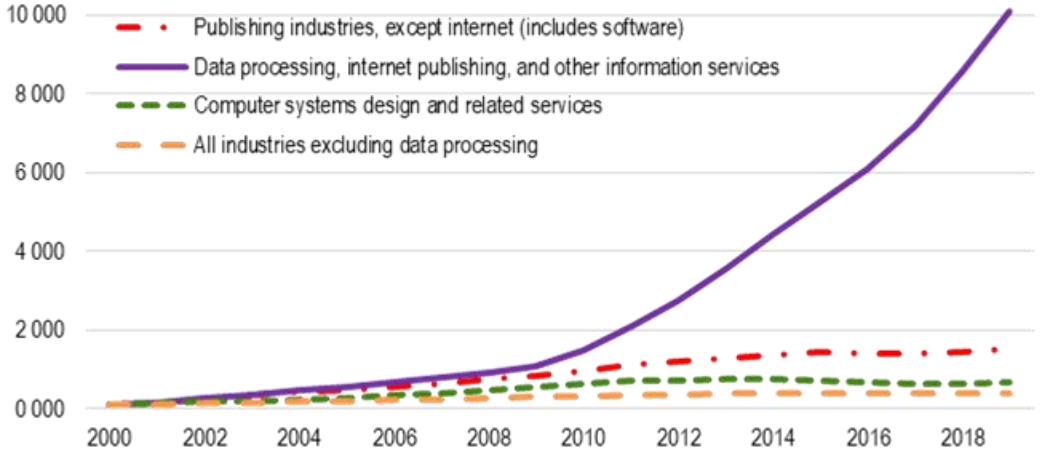
- a softening in output and investment in IT equipment;
- investment in IT equipment to become increasingly industrially and geographically concentrated;
- increases in the cross-border flow of commercial services;
- increases in the relative size of IT services industries;
- increased concentration of IT related labour in those industries providing cloud services;
- potential gains in productivity due to rationalisation associated with cloud computing (lower levels of unused capacity);
- appearance of new products and processes made possible by cloud computing; and
- change in the geographic concentration of imports of ICT equipment.

In practical terms, a move to CCS implies outsourcing some of the hardware and software on which a business (or other organisation) runs its applications and maintains its databases. For many businesses, expensive items such as servers and multi-year software licences can be replaced with smaller, regular payments for ICT services from external providers.[31] These external providers are likely to be concentrated in the ICT services industry.

Any economic changes should be identifiable in economic statistics. However, the IMF points out that the shift towards CCS creates challenges in a statistical system currently adapted to measure the traditional model of ICT provision. This is another reason why it is important to separately identify and publish data on cloud computing. Without an understanding of this shifting dynamic in ICT investment, estimates of capital stock by industry, for example, may be distorted. The 2008 SNA update guidance note on cloud computing illustrates this using data for the United States (Figure 4.3).

Figure 4.3. Real capital stock of ICT hardware

Index (2000=100)



Note: Calculations of the index for all industries excluding data processing (etc.) use capital compensation as weights.
Source: (ISWGNA, 2022[74]) based on BEA-BLS industry-level production account, expanded capital detail (2021 release).

The suppliers of cloud services may be located outside the user's country. If the level of ICT investment continues to be used as an indicator of digital intensity, some firms, industries and countries may appear to be de-digitalising (or at least digitalising more slowly) because they have outsourced their computing requirements. Therefore, there is a need to measure expenditures on CCS in order to capture these services as an input to production, including those that are imported, and to observe the extent to which they are substituting traditional ICT expenditures.

As shown by the increase in cloud use in every OECD country (Figure 4.2), this trend appears widespread. Therefore, it is vital that statistical offices can provide accurate and internationally comparable estimates from the beginning of this change rather than once it is fully established. Ultimately, the production of more granular statistics on the consumption of CCS will permit better understanding of the (change in) use of ICT by businesses.

[31] Furthermore, the ICT products that firms continue to buy are likely to be getting cheaper in real and quality-adjusted terms.

Estimating cloud computing services: challenges

Conceptually, the production and consumption of cloud services are more straightforward to estimate than other areas of digitalisation. The services are usually produced by the businesses that sell them, and they are sold directly to the consumer at a market price.[32] Most businesses and households that consume cloud services would be recording them in the same way as other inputs, making them relatively easy to measure.

The biggest practical challenge for measuring cloud services is the classification issue: deciding which product classification to use. This is a non-trivial issue because the characteristics of cloud computing – accessed over a network, provided on demand, and charged based on usage – can be applied to many different services. Therefore, there are likely to be elements of cloud computing in a range of current product categories.

An OECD Working Paper published in 2021 included an examination of the statistical product classes likely to contain cloud services products (Ker, 2021[78]). Table 4.1 shows the CPC 2.1 sub-classes that the paper identified as containing services associated with CCS.

Table 4.1. CPC sub-classes containing services associated with cloud computing services

CPC sub-class	Sub-class name and type of service
83152	Application service provisioning
	Includes: provision of leased software applications from a centralised, hosted, and managed computing environment:
83151	Website hosting services
	Includes: provision of the infrastructure to host a customer's website and related files in a location that provides fast, reliable connection to the Internet that may be: limited to storage on a single server, in either shared or dedicated capacity, without the service provider managing or integrating software applications (Software hosted on the server is the client's responsibility and service level guarantees are standardised and limited in scope) a bundled service package that consists of the hosting and management of the website and related applications
83159	Other hosting and IT infrastructure provisioning services
	Includes: data storage services, i.e. managing or administrating the storage and back-up management of data such as remote back-up services, storage, or hierarchical storage management (migration) data management services, i.e. on-going management and administration of data as an organizational resource (services may include performing data modelling, data mobilization, data mapping/rationalization, data mining and system architecture.) other IT hosting or infrastructure provisioning services such as hosting client's application, processing client's data and computer time-share
84392	Online software
	Includes: software that is intended to be executed on-line, except game software
84391	Online games
	Includes: games that are intended to be played on the Internet

Source: (Ker, 2021[78]).

The paper points out two important considerations. Firstly, while all the services products identified in Table 4.1 are likely to be delivered online, they are not necessarily delivered using the cloud infrastructure giving rise to the key features of CCS (rapid elasticity, measured service, pooled resources, etc.). For example, while sub-classes 84392 and 84391 mention that payment "may be by

[32] There are examples where the cloud service is provided for free as a mechanism to assist in generating data that is then monetised. However, on most occasions these examples are more consistent with a freemium pricing model than with true free digital services, as discussed in the 2008 SNA update guidance note (https://unstats.un.org/unsd/nationalaccount/RAdocs/DZ3_GN_Free_Digital_Products_Core.pdf).

subscription or pay-per-play", it does not need to be. A consumer may purchase a game or piece of software online as a once-only transaction. They then own this game or software meaning that the transaction is accessed via a network, but it fails several other cloud computing features such as measured service and on demand. The concern is not that the product does not contain services related to cloud services, but rather that they can be delivered in a way that is not consistent with cloud services. The classes can therefore, at best, be described as *"cloud-containing product classes"* (rather than as cloud services products).

Secondly, some of the sub-classes listed such as "other hosting and IT infrastructure provisioning services" or "online games", which are present in both the CPC and Classification of Products by Activity (CPA),[33] contain types of services that meet the definition of CCS (e.g. data storage) as well as types of services that do not meet the definition regardless of how the service is delivered. For example, data mining and data modelling are fundamentally different digital services to those included within the CCS definition (they are outside the scope of CCS).

Such issues are likely to exist whenever pre-existing classifications are used. A final report by the Eurostat Task Force on "Price and volume measures for services activities", finalised in June 2018, included the broad recommendation that "The supply of SaaS should be classified with other software: CPA 58.2 (Software publishing services). PaaS is most likely CPA 62.01 (Computer programming services) while IaaS is CPA 63.11.1 (Data processing, hosting, application services and other IT infrastructure provisioning services)" (European Commision, 2018[79]).[34] This means that these CPA categories include cloud services that will need to be separated out in compiling Digital SUTs to present estimates of CCS separately.

The 2008 SNA update guidance note on cloud computing suggests that "management and support services for CCS are an important part of the cloud computing industry" and that "hosting of servers and software [to be accessed through networks] is a related activity that may be useful to aggregate with cloud computing" (ISWGNA, 2022[74]). Such a broad interpretation would avoid the need to break down certain sub-classes that contain both cloud and non-cloud output; but it implies a reduced focus on CCS specifically.

Box 4.1 provides more detail on the challenges of separating cloud services from the existing CPC categories. Overall, when attempting to estimate the value of CCS in their economy, compilers are strongly encouraged to focus on production that as strictly as possible meets the definition of CCS in this handbook – those that involve computing, data storage, software and IT services – rather than including all services that have some characteristics of cloud technology.

[33] The CPA is the European Union's official classification of products by activity. Within the CPA the sub class is 63.11.1 "*Data processing, hosting, application services and other IT infrastructure provisioning services*".

[34] SaaS refers to Software as a Service, PaaS refers to Platform as a Services, and IaaS refers to Infrastructure as a Service. The final report from the Eurostat Task Force provides more details on each of these definitions.

Box 4.1. Challenges of using product classifications to estimate CCS

When considering which CPC sub-classes should be included in an estimate of CCS for the Digital SUTs, a balance must be found between including more classes so that all types of cloud services can be included while limiting as much as possible the inclusion of non-cloud products.

More and more web-hosting contracts, which are part of CPC sub-class 83151: "Website hosting services" (see Table 4.1), are underpinned by cloud infrastructure; but not all of them are. Any output that is produced using a single server model should not be regarded as a "cloud hosting service" and therefore should not be included in an estimate of CCS.

CPC 2.1 sub-class 83159: "Other hosting and IT infrastructure provisioning services" includes some activities such as data storage services that are cloud services, as well as activities that are simply customers of cloud services. For example, video and audio streaming services are part of this sub-class. These companies may rely on cloud infrastructure to store and serve content, but they tend to use separate cloud service providers to power their content delivery networks. For example, Netflix uses AWS and Microsoft Azure to power its video streaming products. Subscribers buy passive access to a library of content where they can rapidly access content on demand; but they do not have access to computing/data storage/software resources directly. It is the streaming service company, rather than the end user, that is the customer of the cloud service.

The inclusion of audio and video streaming services may imply a precedent for treating products that use cloud services as a key input as equivalent to cloud services themselves. Many other companies and products might be equally reliant on CCS, such as online ride sharing and delivery platforms or social networks.

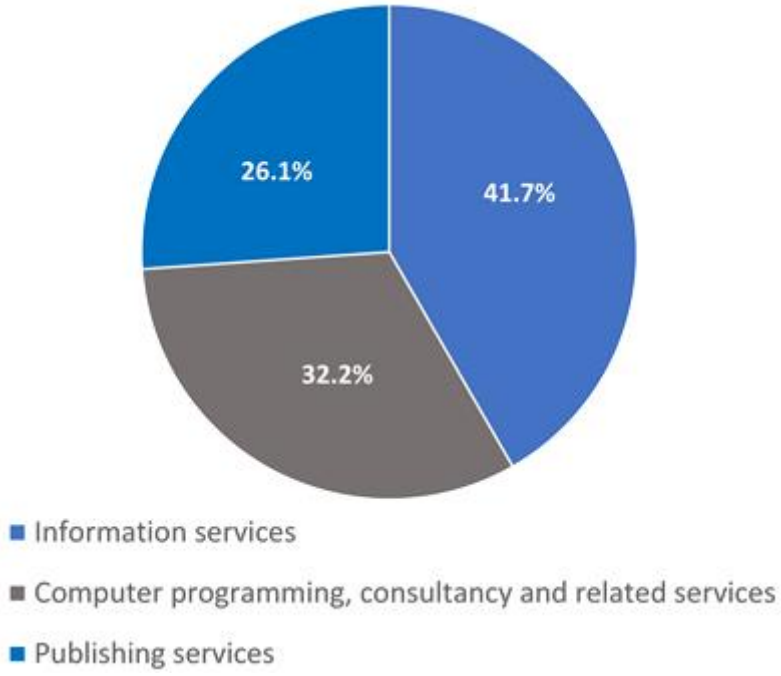
The concern is that as more and more service provision, especially ICT services, becomes not only enabled by cloud technology, but is provided and consumed in a manner that shares similar characteristics to CCS (on demand through a network, flexible, charged on a pay-per-use basis), this would result in all ICT services gradually being thought of as CCS. This would reduce the analytical usefulness of the CCS estimates. Therefore, it is the view of the IAG on Measuring GDP in a Digitalised Economy that countries should try to limit CCS estimates to activities involving computing, data storage, software and IT services. This will enable users to obtain the best information possible. While such a recommendation may require additional modelling, this may be better than the alternative of broad assumptions regarding certain product sub-classes.

Estimating cloud computing services: examples

Statistics Netherlands estimates the production of CCS for their Digital SUTs using the CPA categories recommended by Eurostat's Task Force on "Price and volume measures for services activities". Depending on the product, they allocate to CCS all production (e.g. for data processing, hosting, application services) or a portion of production, which varies based on the industry producing it (e.g. for online software and for computer programming, consultancy and related services). In this way, Statistics Netherlands has identified specific combinations of certain products, produced by specific industries as representative of cloud services. The benefits of this approach are that estimates can be produced for imports and exports of priced CCS and it is also possible to show a breakdown of high-level CPA product categories within the CCS estimate. Figure 4.4 shows that the largest product category is information services.

Figure 4.4. Composition of priced cloud computing services, Netherlands, 2018

% of total

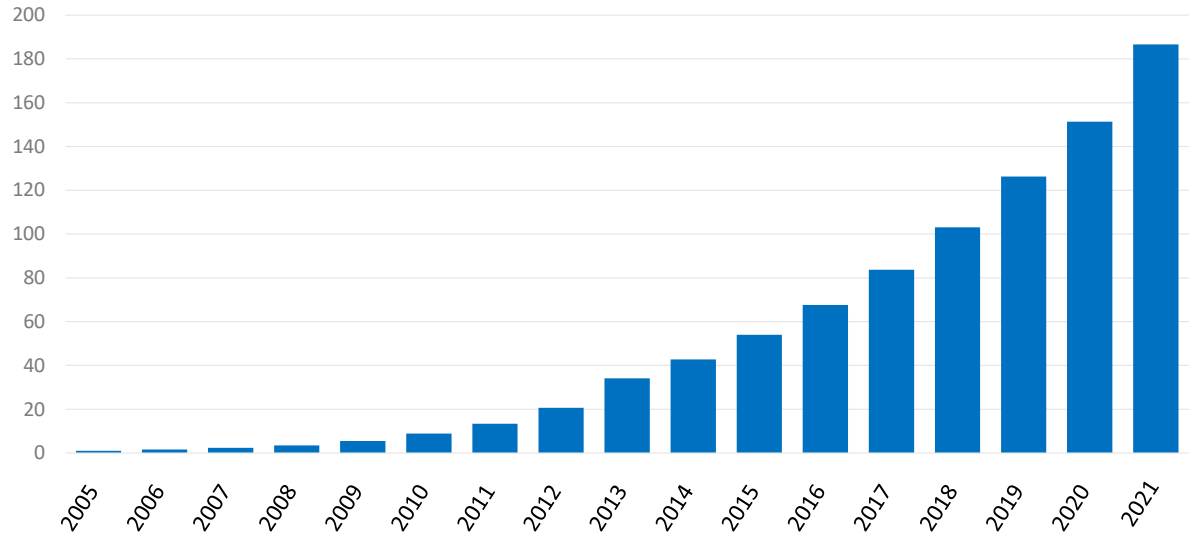


Source: (Statistics Netherlands, 2021[43]).

In its November 2022 Digital Economy Satellite Account publication (Bureau of Economic Analysis, 2022[47]), the BEA updated its estimate of cloud services for the United States. Previously, the BEA used product data from the Economic Census which were "grown using private industry reports and public financial information from companies engaged in cloud computing" (Bureau of Economic Analysis, 2022[80]). However, further investigation found that this estimate contained unrelated internet and data products, which may have resulted in an overestimate of cloud services. The revised method uses data purchased from the International Data Corporation for current years with years prior to 2013 back-cast using publicly available Securities and Exchange Commission filings for major cloud producers. The results suggest that components of CCS within the United States have grown rapidly, increasing 232% from 2015 to 2020 (Figure 4.5). This estimate includes co-location services, data management services, video and audio streaming services, and information and document transformation services so the BEA may be including some elements with cloud characteristics that go beyond the definition of CCS. This highlights some of the measurement difficulties faced by compilers.

Figure 4.5. Gross output of cloud services products, United States, 2005-2021

Billion US dollars



Note: Includes the following products: co-location services; data management services; video and audio streaming services; and information and document transformation services. Estimated by extrapolating product data form the 2012 US Economic Census using private industry reports and public financial information from companies engaged in cloud computing. May include some similar products not meeting the definition of cloud services.
Source: (Bureau of Economic Analysis, 2022[47]).

Japan's publication on "Service areas of product classification 2019" (Japanese Ministry of Internal Affairs and Communications, 2019[81]) also attempts to estimate the level of production of CCS, developing specific product categories for IaaS and PaaS. These include sub-product 37002406 "ICT infrastructure shared services" which is defined as "services that provide fundamental functions for systems/applications to be built upon, including services provided through networks whereby users share equipment or facilities (e.g. servers or storages in data centres)" and 40102100 "ICT applications shared services", described as "services as using networks, servers in data centres, equipment, and storage facilities shared with other users to provide application services". Surveys using these classifications were used in the 2021 economic census, with the intention of data being used in the compilation of the next benchmark SUT in 2025. The initial estimate of CCS was similar to that reported elsewhere.

Separating the underlying survey data, which does not specifically distinguish services meeting the definition of CCS from other products recorded in the same class, is still a work in progress for most countries. As such, early estimates may include some sales of non-cloud service products. However, despite their slightly different definitions and methodology, the results from countries that have already produced estimates of CCS for inclusion in their Digital SUT outputs are broadly similar as a proportion of total output (Table 4.2).

Table 4.2. Production of cloud computing services

Country	CCS % of total output
Canada (2019)	0.3
United States (2021)	0.4
Netherlands (2018)	0.6
Japan (2021)	0.2
Sweden (2017)	0.8

Note: Canada's estimates are for output of North American Industry Classification System (NAICS) class 51821; data processing, hosting and related services. Japan's estimate is a proportion of total income from sales.
Source: (Bureau of Economic Analysis, 2022[80]; Statistics Bureau of Japan, 2023[82]; Statistics Sweden, 2023[83]; Statistics Netherlands, 2021[43]) (Statistics Canada, 2021[29]).

Final considerations for cloud computing services

This section has demonstrated that there is a clear demand for data that shows the production and consumption of CCS in a manner consistent with other products in the national accounts. As more countries produce estimates consistent with or similar to cloud services as defined in the Digital SUT framework, it will be vital to understand country practices for deriving CCS estimates from the product categories in the established international product classifications or their manner of estimating consumption and production of CCS independently.

As noted in the SNA guidance note, there will be a need for "additional collaboration with classification experts on refinement of classifications for the cloud computing and related industry and products" (ISWGNA, 2022[74]). Updates of the CPC and related product classifications should provide opportunities to improve estimation of CCS. They should also aim to avoid unintended consequences for CCS estimation, such as the expansion of categories containing products associated with CCS (currently used by some countries to estimate CCS) to include additional products that are not predominantly CCS products.

Digital intermediation services

Definition of digital intermediation services in Digital SUTs

Digital intermediation services (DIS) are produced by Digital Intermediation Platforms (DIPs) when they match a buyer/consumer of a good or service with a seller/producer. While DIS is not currently listed in international product classifications, it is not new. Existing activities such as "sales on a commission basis" and "reservations services" usually involve businesses facilitating transactions between two independent parties, and this may be done digitally. However, with digital intermediation now occurring in more and more industries, the CPC and other product classifications are being revised to better record such activities.

Since DIS is seen as the product produced by DIPs, there is a complimentary definition in Chapter 5, where DIPs are defined as:

> *Businesses that operate an online interface that facilitate, for a fee, the direct interaction between multiple buyers and multiple sellers, without the platform taking economic ownership of the goods or rendering the services that are being sold (intermediated).*

The product of these units, the DIS, will be defined as:

> *Online intermediation services that facilitate transactions between multiple buyers and multiple sellers in exchange for a fee, without the online intermediation unit taking economic ownership of the goods or rendering the services that are being sold (intermediated).*

The definition goes into detail regarding ownership of the good or services being sold in order to make clear that the DIS is a product in itself and should not be considered a margin added on top of the value of the underlying product. Margins are usually represented as an additional retail or distributional cost added on top of the producer prices to arrive at the price paid by the consumer. Rather, as discussed below, the DIS is a product usually consumed by the producer and considered another cost of production.[35] This difference is fundamental in separating out the DIS from retail and wholesale trade.

The definition used for the Digital SUT framework specifically mentions online facilitation of transactions. Intermediation services can be provided on a non-digital basis, but the Digital SUT framework specifically focuses on digital output. This may result in a difference between the definition used here and that used in updates of the product classifications, as product classifications have to be broad enough to cover digital and non-digital intermediation services.

An update of CPC Version 2.1 is expected to be presented to the United Nations Statistical Commission in 2024. Early discussion on the update suggests that intermediation products will be shown together at division (2-digit) level with the lower-level groups, classes and sub-classes reflecting the nature of the goods and services facilitated by the intermediation. For example, the intermediation service provided by a DIP when it facilitates a transaction between a consumer of accommodation services with a person looking to rent out their home would be in a different sub-class to the intermediation service provided by a DIP that facilitates a transaction between a driver with a consumer looking for a ride; but both would belong to in the same division.

Whatever the outcome of the CPC update discussion, in the Digital SUT framework the service of facilitating a transaction between a consumer and a producer in exchange for a fee is considered the same product regardless of the underlying good or service being intermediated. In the Digital SUTs, all output of intermediation products should be recorded in a single product row: the DIS row.

Why separately identifying digital intermediation services is important

Thanks to the internet and other digital tools, there is now continual communication between sellers and DIPs, with much increased availability of products, regardless of the geographical location of the producer or the consumer. The ability of buyers to compare similar products, at the touch of a button and for no explicit cost, has made intermediation platforms desirable for many consumers. Overall, as will be elaborated on further in Chapter 5, the growing use of DIPs is of considerable interest to users.

Bringing all instances of DIS into a single product category provides a clear interpretable number which can reflect the impact of DIPs on the economy. Furthermore, the aggregation of all DIS into a single row is consistent with the treatment of DIPs in the Digital SUTs. From the industry perspective (as outlined in Chapter 5) all DIPs are aggregated into a single “digital industry” to provide a clearer picture of their contribution to value added of the economy. Therefore, within the Digital SUT framework, all DIPs are contained within a single industry column and the product they produce, the DIS, is contained within a single product row.

[35] While the explicit fee charged by the DIP can be to either the producer or consumer, or to both, in almost all cases a charge is made to the producer. The consumer is charged in some but not all cases.

In some situations, a component of the fee associated with DIS is separately invoiced to the consumer, on these occasions this portion is considered as household consumption. However, on almost all occasions, the DIS product is consumed as intermediate consumption as the producer is usually responsible for all or part of the fee. As such, a split based on those industries that are consuming the DIS product and shown as intermediate consumption in the use table will provide additional analytical detail on industries that are using intermediation platforms to reach final consumers.

A final reason why it is important to separately identify DIS is that including a third party that provides value added (DIS) to the production chain, but does not take ownership of the product, challenges the traditional producer/seller and consumer/buyer paradigm that features in almost every transaction recorded in the accounts. This leads to two measurement issues. The first is that the additional player creating output can distort the picture of where price changes are coming from. It is important to attempt to separate changes in the price of DIS from changes in the underlying product[36]. The second is that the flow between the additional player and the producer and/or consumer must be appropriately recorded. This is discussed further in the section on **consumer and producer approaches to measuring DIS**.

Estimating digital intermediation services: examples

The recording of DIS goes hand in hand with the recording of output from DIPs. Conceptually, this is quite straightforward. The output is (usually) produced by formal units, which charge a market price in direct exchange for the provision of a service (the intermediation service). Therefore, output can be calculated in a conventional way, by identifying and surveying the units that produce the service.

However, there are practical concerns in the measurement of DIS that may not exist for other products. So far, in work undertaken to try and estimate DIS there appear to be three approaches. These are:

- Creating estimates of DIS on the assumption that units identified as DIPs are solely responsible for the production of DIS, so that output of DIPs and DIS are the same.
- Modelling estimates of DIS from known business information and surveys.
- Separately identifying production of DIS within existing product estimates.

Of these three options, there are examples of countries undertaking the first two approaches. These are discussed below. The last option is also discussed even though the IAG is not aware of any countries that have used this approach to estimate DIS.

Examples based on output of DIPs

For this approach, units considered to be producing DIS are surveyed, with their output calculated in the standard way. The most important assumption for this approach is that the units considered part of the DIP industry (see Chapter 5) only produce DIS. While this seems to be a reasonable assumption, it is also possible for other units beyond DIPs to produce DIS. For example, a unit may, in addition to reselling goods they own or selling goods that they produced themselves, also facilitate the purchase of other goods and services. Unless the unit predominately produces DIS, they will be classified in an industry other than DIPs. Therefore, this approach is likely to produce an underestimate of DIS. However, this underestimate is likely to be small as it appears that output of DIS from the large DIPs accounts for most of the DIS produced.

[36] Work in this area was presented to the Voorburg Group on Service Statistics, see (Hernandez Santacoloma, 2022[118]; Boey, 2022[117]).

As discussed in Chapter 5, arguably the biggest challenge with this approach is the practical identification of DIPs in the business register. However, once identified, these units can be surveyed, and estimates can be compiled in a manner similar to estimates of other products. Such an approach was undertaken by Statistics Netherlands following the successful identification of DIPs using a systematic machine learning approach (see Chapter 5). Their compilation of DIS estimates is presented in Box 4.2.

Box 4.2. Producing DIS estimates in the Netherlands

Using conventional business surveys to compile estimates of production of DIS based on DIP output

Following the identification of potential DIPs, including those that charge an explicit fee, Statistics Netherlands obtains information from their annual Structural Business Survey. This is used to split the platforms between those where more than 50% of employees work on intermediation and those that fall below this threshold. The former are considered predominately DIPs and are reallocated to the DIP industry. Statistics Netherlands notes that of those units identified as DIPs, "the largest businesses are fully specialised digital intermediary platforms". (Statistics Netherlands, 2021[43])Calculations are undertaken to separate the output from these DIPs that is considered DIS from the production of more traditional products. Those platforms where fewer than 50% of employees work on intermediation are left in their "conventional" industry. A fraction of their output, estimated according to the products that different industries are producing, is considered DIS and is reallocated to the DIS product.

Statistics Netherlands is also able to apply data from their international trade in services survey to estimate what percentage of DIS is being exported. However, because DIS estimates depend on production data from resident businesses, there is no information on the amount of DIS imported.

Source: (Statistics Netherlands, 2021[43]).

Using the data collection and methodology outlined in Box 4.2, Statistics Netherlands has calculated that in 2018, DIS made up around 12.2% of all digital products produced within the Netherlands, with a value of 15.5 billion euros (see Table 4.3). Most of total DIS output in the Netherlands was exported (see Table 4.4), reflecting the fact that there are a large number of multinational platforms based in the Netherlands for fiscal reasons.

Table 4.3. Supply of ICT goods and digital services, Netherlands, 2018

Billion euros

	Supply			
	Output	Imports	Other	Total
ICT Goods	36.0	52.1	0.3	88.4
Prices digital services except cloud computing services and digital intermediary services	67.3	10.5	0.0	77.8
Priced cloud computing services	8.5	1.8	0.0	10.3
Priced digital intermediary services	15.5	-	-	-
Total Digital Products	127.3	-	-	-

Note: * Other supply e.g. import tariffs, other use e.g. accumulation of stock.
Source: (Statistics Netherlands, 2021[43]).

Table 4.4. Use of ICT goods and digital services, Netherlands, 2018

Billion euros

	Use					
	Gross Fixed capital Formation	Intermediate Consumption	Exports	Household Final Consumption	Other*	Total Use
ICT Goods	5.6	17.8	60.4	4.4	0.2	88.4
Prices digital services except cloud computing services and digital intermediary services	21.9	34.3	15.2	6.6	-0.2	77.8
Priced cloud computing services	0.0	6.5	3.1	0.7	0.0	10.3
Priced digital intermediary services	0.0	-	13.6	-	-	-
Total Digital Products	27.5	-	92.3	-	-	-

Note: * Other supply e.g. import tariffs, other use e.g. accumulation of stock.
Source: (Statistics Netherlands, 2021[43]).

Examples of estimating DIS from known business information and surveys

Another alternative involves attempting to identify the output of goods and services ordered via a DIP and then using this amount to estimate the DIS being produced.

Since every transaction undertaken via a DIP involves the production of DIS, the level of DIS produced is related to the transactions taking place. The pricing structure associated with DIS is often quite complicated. Some DIPs charge a set fee regardless of the value being transacted, while others charge a percentage of the value over a minimum fee. The difference in price may be due to a variety of factors, including competition and quality of the service provided. Therefore, the value as well as the quantity of the transactions are important; with both of these pieces of information, an “effective DIS rate” can be calculated and used to estimate the total DIS produced.

An example of this work is provided in Chapter 5, where data that is publicly available from Airbnb is used to estimate both the value added of the owners of the accommodation being rented out and the output of the intermediation service provided by the DIP. Research showed that the platform fee charged to the guests is 6% to 12% of the rent, the exact rate depending on the amount of the rent (Tobiassen, 2021[84]). Since it is separately invoiced to the consumer, it is considered final household consumption of DIS. Depending on the location of the platform, this may also show up in imports and export of these services.

Another example is the approach being developed by the United States BEA for the ride share business (see Box 4.3). They apply indicators to the conventional product rows in the existing SUTs to calculate the value of the output associated with platforms. Then they apply publicly available information from platforms and companies’ annual financial reports to work out how much of the final output remained with the platform, representing the value of the DIS.

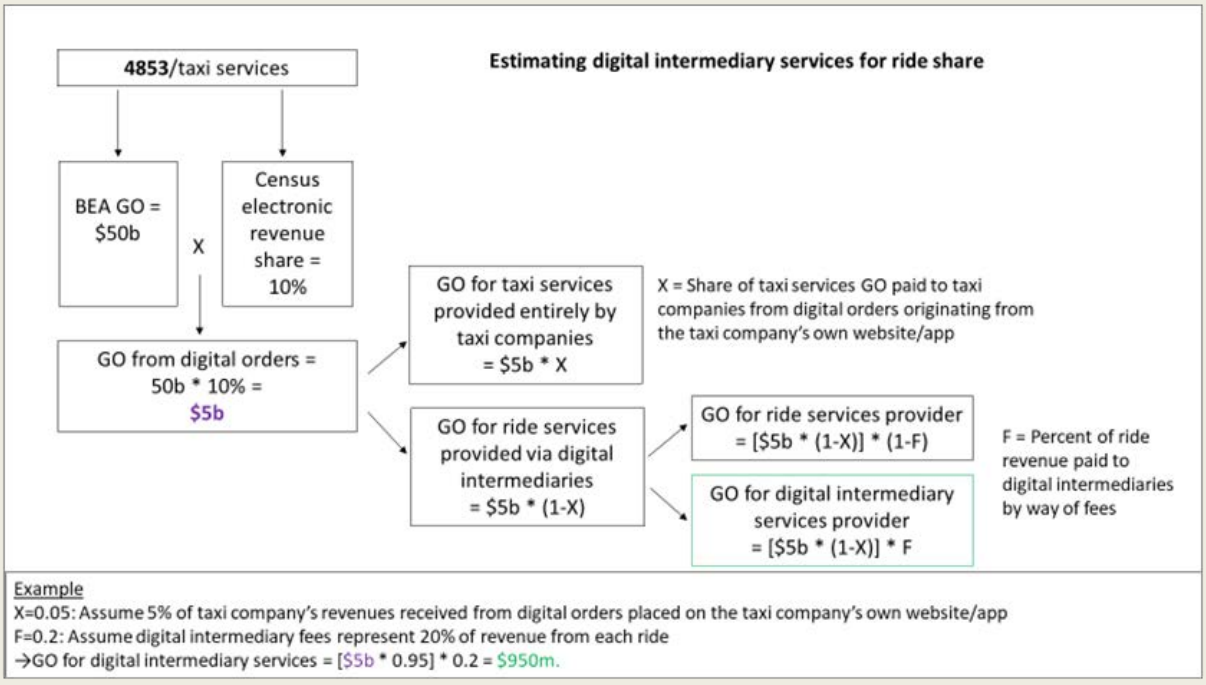
Box 4.3. DIS associated with rideshare in the United States

Currently, the BEA's Digital Economy Satellite Account (DESA) does not include estimates for DIS resulting in an incomplete picture of the digital economy. BEA has proposed the first phase in developing estimates of DIS that focuses initially on two service areas of immediate interest to their users, person-to-person (P2P) accommodation and P2P ride shares.

The main data sources proposed for the estimates are the economic census and company annual financial reports. Estimates are derived by working out a percentage for "electronic revenue" from the economic census[37] and applying this to output from existing SUTs (Figure 4.6). A proportion of the electronic revenue (or customer's expenditure on transport via a DIP) is considered to belong to the supplier of the underlying service, e.g. the taxi company. In these instances, no DIS is produced as no transaction is facilitated between producer and consumer.

Finally, a proportion of the customer's expenditure on transport facilitated via a DIP is considered to represent the DIS provided by the DIP. This proportion is based on information taken from the financial reports. While only focusing on two products for the time being, this model provides a basis on how estimates of DIS may be compiled.

Figure 4.6. Example of modelling digital intermediation services



Note: GO = gross output; Estimates are provided for illustration purposes only.
Source: (Bureau of Economic Analysis, 2022[47]).

[37] Electronic revenue is defined as sales of goods and services where the buyer places an order, or the price and terms of the sale are negotiated, over Internet, a mobile device (M-commerce), extranet, Electronic Data

Examples based on separating DIS from existing product estimates

The output of DIS is already included in estimates of output of existing units within the national accounts, so estimates of DIS are included in those of other products. This means that one way to estimate DIS would be to separate out the relevant values from the existing product classes. No countries are currently doing this at present, but it is an option.

There are several classes in the CPC where DIS may be included. While often the CPC categories do not explicitly mention the term intermediation, the explanatory notes may provide clues that the product is similar to intermediation services. For example:[38]

- CPC class 8551: Reservation services for transportation
- CPC class 8552: Reservation services for accommodation, cruises and package tours
- CPC class 8553: Other reservation services

These three classes incorporate services that include "obtaining a client's requirements, advising on alternatives, assisting in the client's choice and may include issuance of tickets on behalf of the service provider. They are often provided in person, by telephone or over the Internet. Respective reselling services are also included" (UNSD, 2015[25]).

While the explanatory notes mention acting "on behalf of the service provider" which is similar to the proposed definition of intermediation services, the notes also incorporate "reselling services", which is fundamentally different to intermediation services. However, since services by definition are not able to be held as inventory, it is likely that the CPC interpretation of "reselling" is closer to intermediation as defined in the Digital SUTs than to the traditional retail business model.

There are also several products that explicitly include intermediation in the explanatory notes in a way that is consistent with the proposed definition. These include CPC class 8511: *Personnel search and referral services* and CPC class 7223: *Land sales on a fee or contract basis*. Both of these describe intermediation services between a buyer and seller of specific goods or services.

While not often published at such a low level of breakdown, many NSOs may already have this information internally. If this is the case, it should be possible to separately identify those services produced digitally, in exchange for a fee, without taking any ownership of the underlying product. In some cases, it may be decided that the entire class meets these three DIS criteria.

It should be noted that the classes currently identified in the CPC in relation to intermediation services mainly reflect the products that were purchased via intermediation when CPC Version 2.1 was published in 2015, that is, travel and tourism services. Intermediation services are now used more widely; but using the CPC product classes as a starting point for estimation may provide a way to produce initial estimates.

Interchange (EDI) network, electronic mail, or other comparable online systems (United States Census Bureau, 2022[45]).

[38] While CPC is explicitly mentioned, the product classes mentioned in the following paragraphs are also represented in the equivalent regional classifications such as CPA, NAPCS. For example, 79.11.1: *Travel agency services for transport reservations*, 79.11.2: *Travel agency services for reservation of accommodation, cruises and package tours*, and 79.90.3: *Other reservation services n.e.c*, in the CPA. The likely equivalent in the NAPCS would be 3150101: *Reservation service for passenger transportation*, 31502: *Lodging reservation service*, and 31803: *Other leisure and travel services, n.e.c.*.

Recording DIS in the accounts - the consumer and producer approaches

Transactions involving the production and consumption of DIS, can be recorded from either the "consumer" or "producer" perspective (Box 4.4). The difference between the two is whether all transactions between the parties involved are recorded as they occur in the real world or if certain flows are re-routed between parties in order to better reflect the actual flow of services occurring. The difference may be important, especially if the DIP involved is a non-resident, as the choice may have a significant impact on trade statistics.

There is general agreement in the national accounts community that recording from the producer perspective is the appropriate treatment. This includes endorsement at the 12th meeting of the ISWGNA Advisory Expert Group on National Accounts (ISWGNA, 2018[85]) and the global consultation on DIPs for the update of the 2008 SNA (ISWGNA, 2022[86]). The global consultation provided overwhelming support for the producer approach to measuring DIPs and DIS in the accounts (ISWGNA, 2022[87]). It has also been included as the preferred approach in both the Handbook on Measuring Digital Trade (IMF, OECD, UNCTAD, WTO, 2023[13]) and the OECD/G20 Roadmap toward a Common Framework for Measuring the Digital Economy (OECD, 2020[6]).

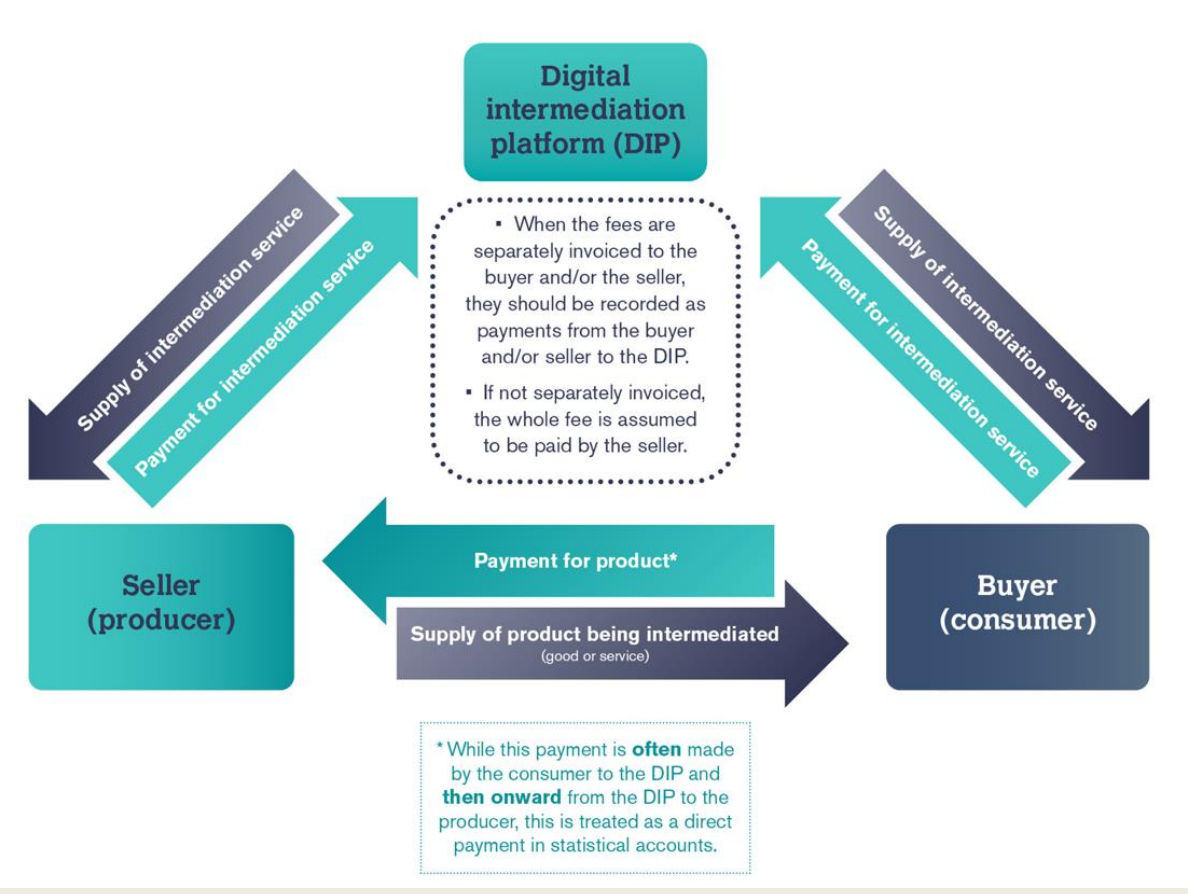
The balance of payments community also takes this approach in its guidance note for the update of the 7th Balance of Payment Manual (BPM7) on "Merchanting and Factoryless Producers; Clarifying Negative Exports in Merchanting; and Merchanting of Services" (IMF: BOPCOM, 2022[88]). As well as discussing similar arguments, it includes the point that by definition services "are not separate entities over which ownership rights can be established [and as] they cannot be traded separately from their production" (see SNA §6.17 (UNSD, Eurostat, IMF, OECD, World Bank, 2009[18]). In theory, the same holds for intermediation of services, that is, it is impossible for the DIP to purchase and then resell a service. Thus, the producer approach is the only viable option for recording DIS.

Box 4.4. Recording flows of DIS – consumer and producer perspectives

The consumer perspective focuses primarily on the flow of money from the consumer. In many cases, for the payment, the consumer interacts only with the DIP. The interaction with the producer is often only around the provision of the service: there is no monetary transaction. Additionally, since the consumer does not pay the producer directly, the producer must seek payment from the platform, which holds the payment in trust until the service is provided. A literal recording of this situation would likely consist of a flow from the consumer to the platform with a follow-up payment from the platform to the producer. Such a treatment would reflect the DIP as "buying" the product from the producer to resell to the final buyer. However, this does not reflect the actual role of the DIPs, and the significant difference that exists between DIPs and retail traders, i.e. the DIPs do not take ownership of the goods or services in question and have a reduced level of financial risk.

The producer perspective focuses primarily on who the producer is providing the underlying services to (the person making the payment) and who the producer pays in order to facilitate the transaction, allowing for the underlying service to be provided. As such, the DIS product is treated as intermediate consumption paid by the producer as a cost of producing the final product provided to the consumer. This is outlined in Figure 4.7.

Figure 4.7. Recording flows of DIS – consumer and producer perspectives



Source: (IMF, OECD, UNCTAD, WTO, 2023[13])

In this approach, the intermediation service product produced by the platform is consumed by the producer as intermediate consumption; and possibly in part by the consumer as final consumption, depending on the criteria of the platform. A transaction is recorded between the consumer and the platform only if the platform charges a separately invoiced fee for the intermediation service direct to the consumer. Whether the fee is paid by the consumer, the producer or both makes no difference to the ultimate level of value added being created by either the producer or the DIP. A numerical example is shown in Annex 4.B. Most importantly, the payment for the underlying good or service, which includes any amount paid by the producer to the platform, is reflected as going from the consumer to the producer, despite it most likely being paid via the platform and held in trust by the DIP.

Focusing on the producer has two clear advantages:

- If the DIP is a non-resident, this treatment removes the possibility of a distortion in the level of imports and exports from the country in which the DIP resides, as the underlying product remains a flow between the resident producer and resident consumer.
- It provides a better reflection of the products (and the industries producing them) being consumed via transactions facilitated by DIPs. Even if the DIP is a resident entity, a distortion might exist if the value of final consumption of all products purchased via a DIP is represented as being produced by the DIP industry regardless of the underlying product.

Practical challenges when measuring DIS

Despite the general agreement on how the DIS should be recorded, the results of the global consultation on DIPs (ISWGNA, 2022[87]) also emphasised that there are a number of practical issues that NSOs will face when attempting to implement the recommendations. There are three broad challenges:

1. The differences in business models of DIPs create difficulties in appropriately recording the flows of DIS.
2. The producer approach to measuring DIS still poses significant measurement challenges and data requirements.
3. If the DIP producing the DIS is a non-resident, compilers may need to rely on modelling or information sharing between NSOs at the firm level.

The different business models include the different ways that DIPs collect revenue. Some DIPs charge a percentage of the value of the product, whereas others charge a flat rate. Some only charge the producer, while others charge both the producer and the consumer. Table 4.5 outlines three different scenarios that may be encountered by compilers. If the fees are separately itemised on the invoice and attributable to the seller/producer and/or the consumer/buyer, they are referred to as “explicit”. If this is not the case, the fees are considered as “implicit” and compilers will need to make assumptions about both the value of the fee and who pays for it.

Table 4.5. Explicit and implicit fees paid to DIPs

Description	Type	Recording
The fees paid by the buyer and/or the seller are known	Explicit	Show fees paid from buyer and/or seller to DIP
It is known who pays the fee(s), but the amount is not known	Implicit	Estimate fees paid from buyer and/or seller to DIP
It is not known who pays the fee and the amount is not known	Implicit	Estimate total fee and show total paid by the seller to DIP

Note: Explicit and implicit fees in this table can be understood as meaning what is known to the compiler.
Source: (IMF, OECD, UNCTAD, WTO, 2023[13]).

These differences can make modelling the amounts difficult. An assumption based on the business model of one platform may over-estimate or under-estimate the value of the product produced by another platform. Responding to such challenges will require greater understanding of DIPs and sharing of knowledge across NSOs.

The second set of challenges relates to the producer approach to measuring DIS. Due to the redirection of certain transactions as well as the possibility of imperfect information, applying the producer approach in the national accounts may require imputations to estimate the production of DIS and the output of DIPs. A similar situation applies to retail margins as, in the conventional SUTs, the margin has to be separated from the underlying value of the good. This calculation is usually undertaken by NSOs by taking the cost of a good away from the final charge to the consumer. It would depend on being able to obtain these two values from the DIPs. Such information should be available using traditional survey methodologies, as long as the DIP is a resident business and included on the business register.

The third set of challenges relates to non-resident DIPs. If the DIPs are non-residents, the DIS being consumed is imported and the exact values allowing for a residual calculation of the DIS will probably be unavailable.[39] In these instances, calculation of DIS will have to be modelled using available household and business statistics.

Conclusion

In many of the initial attempts to measure the digital economy, NSOs created estimates based on selecting products considered to be digital (Barefoot et al., 2018[8]; Statistics Canada, 2019[9]; Australian Bureau of Statistics, 2019[10]). While these estimates did not provide the full picture of the digital economy desired by users, this does not mean that separating out specific products is not worthwhile. Recording the changing nature of output shows not only the evolving nature of the products required for use in production, but also where the production is coming from.

Since the compilation of the conventional SUTs involves the generation of estimates related to the production of various goods and services, separating out ICT goods and digital services within the Digital SUT framework is feasible. Doing so provides an indication of the level of digitalisation occurring in the economy, including in parts of the economy that are not predominantly digital.

Finally, by creating estimates of output related to specific aspects of digitalisation and key components of the digital economy, compilers can provide relevant insights into important digitalisation trends, such as the take up of CCS and production of DIS. The role of intermediation in production chains and the change from investing in physical goods and hardware to purchasing intangible and flexible ICT services are two key areas of focus for users.

The ideal product breakdowns outlined in the framework will probably require the development of new data sources and methods. As more and more countries produce estimates of these products, best practices will be shared that will assist other countries in their compilation efforts.

[39] This challenge could be addressed via sharing of information between countries on MNEs' revenue, including importantly, the source of the revenues. Such a solution has been discussed in regard to the challenges faced by globalisation, with initial programs beginning to be developed such as Eurostat's Early Warning System, https://ec.europa.eu/eurostat/web/economic-globalisation/early-warning-system#:~:text=The%20EWS%20is%20a%20structured,work%20on%20concrete%20restructuring%20cases.

Annex 4.A. Information and Communication Technologies (ICT) as defined in the CPC

Annex Table 4.A.1. Information and Communication Technologies (ICT) as defined in Central Product Classification (CPC), Version 2.1, Part 5: Alterative Structures

CPC Ver.2.1 subclass	Product description (CPC subclass title)
	Computers and peripheral equipment
45142	Point-of-sale terminals, ATMs and similar machines
A45220	Portable automatic data processing machines weighing not more than 10 kg, such as laptops, notebooks and sub-notebooks
45230	Automatic data processing machines, comprising in the same housing at least a central processing unit and an input and output unit, whether or not combined
45240	Automatic data processing machines presented in the form of systems
45250	Other automatic data processing machines whether or not containing in the same housing one or two of the following types of units: storage units, input units, output units
45261	Input peripherals (keyboard, joystick, mouse etc.)
45262	Scanners (except combination of printer, scanner, copier and/or fax)
45263	Inkjet printers used with data processing machines
45264	Laser printers used with data processing machines
45265	Other printers used with data processing machines
45266	Units performing two or more of the following functions: printing, scanning, copying, faxing
45269	Other input or output peripheral devices
45271	Fixed media storage units
45272	Removable media storage units
45289	Other units of automatic data processing machines
45290	Parts and accessories of computing machines
47315	Monitors and projectors, principally used in an automatic data processing system
47550	Solid-state non-volatile storage devices
	Communication equipment
46921	Burglar or fire alarms and similar apparatus
47211	Transmission apparatus incorporating reception apparatus
47212	Transmission apparatus not incorporating reception apparatus
47213	Television cameras
47221	Line telephone sets with cordless handsets
47222	Telephones for cellular networks or for other wireless networks
47223	Other telephone sets and apparatus for transmission or reception of voice, images or other data, including apparatus for communication in a wired or wireless network (such as a local or wide area network)
47401	Parts for the goods of subclasses 47221 to 47223
	Consumer electronic equipment
38581	Video game consoles
47214	Video camera recorders
47215	Digital cameras
47311	Radio broadcast receivers (except of a kind used in motor vehicles), whether or not combined with sound recording or reproducing apparatus or a clock
47312	Radio broadcast receivers not capable of operating without an external source of power, of a kind used in motor vehicles

CPC Ver.2.1 subclass	Product description (CPC subclass title)
47313	Television receivers, whether or not combined with radio-broadcast receivers or sound or video recording or reproducing apparatus
47314	Monitors and projectors, not incorporating television reception apparatus and not principally used in an automatic data processing system
47321	Sound recording or reproducing apparatus
47323	Video recording or reproducing apparatus
47330	Microphones and stands therefor; loudspeakers; headphones, earphones and combined microphone/speaker sets; audio-frequency electric amplifiers; electric sound amplifier sets
47402	Parts for the goods of subclasses 47321, 47323 and 47330 Miscellaneous ICT components and goods
	Miscellaneous ICT components and goods
45281	Sound, video, network and similar cards for automatic data processing class
47130	Printed circuits
47140	Thermionic, cold cathode or photo-cathode valves and tubes (including cathode ray tubes)
47150	Diodes, transistors and similar semi-conductor devices; photosensitive semi-conductor devices; light emitting diodes; mounted piezo-electric crystals
47160	Electronic integrated circuits
47173	Parts for the goods of subclasses 47140 to 47160
47403	Parts for the goods of subclasses 47211 to 47213, 47311 to 47315 and 48220
47530	Magnetic media, not recorded, except cards with a magnetic stripe
47540	Optical media, not recorded
47590	Other recording media, including matrices and masters for the production of disks
47910	Cards with a magnetic stripe
47920	“Smart cards”
48315	Liquid crystal devices n.e.c.; lasers, except laser diodes; other optical appliances and instruments n.e.c.
48354	Parts and accessories for the goods of subclass 48315
	Manufacturing services for ICT equipment
88741	Electronic component and board manufacturing services
88742	Computer and peripheral equipment manufacturing services
88743	Communication equipment manufacturing services
88744	Consumer electronics manufacturing services
88749	Magnetic and optical media manufacturing services
	Business and productivity software and licensing services
47811	Operating systems, packaged
47812	Network software, packaged
47813	Database management software, packaged
47814	Development tools and programming languages software, packaged
47821	General business productivity and home use applications, packaged
47829	Other application software, packaged
73311	Licensing services for the right to use computer software
83143	Software originals
84341	System software downloads
84342	Application software downloads
84392	On-line software
	Information technology consultancy and services
83117	Business process management services
83131	IT consulting services
83132	IT support services
83141	IT design and development services for applications
83142	IT design and development services for networks and systems
83151	Website hosting services
83152	Application service provisioning

CPC Ver.2.1 subclass	Product description (CPC subclass title)
83159	Other hosting and IT infrastructure provisioning services
83161	Network management services
83162	Computer systems management services
	Telecommunications services
84110	Carrier services
84120	Fixed telephony services
84131	Mobile voice services
84132	Mobile text services
84133	Mobile data services, except text services
84140	Private network services
84150	Data transmission services
84190	Other telecommunications services
84210	Internet backbone services
84221	Narrowband Internet access services
84222	Broadband Internet access services
84290	Other Internet telecommunications services Leasing or rental services for ICT equipment
	Leasing or rental services for ICT equipment
73124	Leasing or rental services concerning computers without operator
73125	Leasing or rental services concerning telecommunications equipment without operator
73210	Leasing or rental services concerning televisions, radios, video cassette recorders and related equipment and accessories Other ICT services
	Other ICT services
83325	Engineering services for telecommunications and broadcasting projects
87130	Maintenance and repair services of computers and peripheral equipment
87153	Maintenance and repair services of telecommunication equipment and apparatus
87331	Installation services of mainframe computers
87332	Installation services of personal computers and peripheral equipment
87340	Installation services of radio, television and communications equipment and apparatus

Source: (UNSD, 2015[25])

Annex 4.B. The producer versus the consumer perspective

When a transaction that involves the production and consumption of DIS occurs across borders, the choice of recording the DIS transaction from either the consumer or producer perspective does not make a difference to the overall GVA level for either country. However, there is potentially a significant difference in the imports and exports estimates. Annex Table 4.B.1 shows an example.

Annex Table 4.B.1. Reconciliation of transactions involving DIPs, gross and net approach

Producer Perspective		Consumer Perspective	
Country A		Country A	
Output	100	Output	80
Intermediate consumption	20	Intermediate consumption	0
GVA	***80***	***GVA***	***80***
Household Consumption	100	Household Consumption	100
Imports	20	Imports	100
Exports	0	Exports	80
GDP	***80***	***GDP***	***80***
Country B		Country B	
Output	20	Output	100
Intermediate consumption	0	Intermediate consumption	80
GVA	***20***	***GVA***	***20***
Household Consumption	0	Household Consumption	0
Imports	0	Imports	80
Exports	20	Exports	100
GDP	***20***	***GDP***	***20***

Country A pays $100 for a service, purchased using a DIP. The DIP is a resident in Country B and charges an intermediation service fee of $20. However, this is not separately invoiced to the consumer. The producer of the services is also in Country A and after factoring in all input costs, including the $20 intermediation fee, charges $100 for their service.

From the producer perspective, the output of the producer ($100) is equal to the household consumption ($100), with the intermediation service fee ($20) being recorded as an import and then intermediate consumption for the producer. This results in Gross Value Added (GVA) of $80 and $20 for Country A and Country B respectively.

From the consumer perspective, the GVA estimate for each country remains the same as in the net approach. However, the import and export estimates are both significantly higher as the full output of the producer ($80) would have been considered an export from Country A and an import by Country B, with a subsequent export of $100 being recorded, representing the full value of the service being recorded as household consumption and an import into Country A after the DIP has applied their value added ($20). Arguably, the approach focusing on the consumer transaction distorts the true level of output coming from the digital intermediary service provider.

This treatment results in output from a service producer in Country A being recorded as output and an export from a different country in which the producer does not reside. While there is no distortion to the GDP estimate as this is offset by the service import also being recorded, it still appears counterintuitive, as the value of the underlying product would be "traded" across borders twice, despite the product having never left the country of the buyer and producer.

DIP fees paid by producers versus consumers

Specific flows vary greatly between DIPs. While the DIS benefits both the producer and the consumer, some DIPs charge a clearly invoiced fee to the consumer and the producer while others charge only the producer who, in effect, subsidises the consumer.[40] A further complication is whether the fee is explicit and therefore easily obtainable by statistical compilers, or implicit and needs to be imputed **(**see Annex Table 4.B.2**)**.

Regardless of whether the fee is explicit or implicit, the main transaction (for the intermediated product) between the consumer and the producer should reflect the full value that the buyer pays less the fee paid by the buyer to the DIP (if there is one). Annex Table 4.B.2 shows an example. The intermediation fee of $12 is split evenly between the producer (who pays $6, recorded as intermediate consumption) and the consumer (who pays $6, recorded as Household final consumption). The amount recorded as paid by the consumer to the producer reflects the full value that the buyer pays ($100) less the fee paid by the buyer to the DIP ($6).

Annex Table 4.B.2. DIS paid by both producer and consumer

	Buyer	Seller	DIP	Total
Output		94	12	106
Intermediate consumption		46	4	50
Of which				
Goods and services used for production		40	4	44
Intermediation service fee		6	0	12
Gross Value Added		**48**	**8**	**56**
Household Final Consumption	**100**			**100**
Of which				
Intermediation service fee	6			
Paid to seller	94			

Alternatively, if no fee is charged to the consumer or no information on the payment of fees is known, the payment between consumer and producer should reflect the value of the good or service being intermediated plus the intermediation fee ultimately paid by the producer as intermediate consumption. The example in Annex Table 4.B.3 shows the full $100 being paid to the producer as they are responsible for paying the full $12 intermediation fee.

[40] On top of the variance in business models, there can be occasions when separately charged fees are reduced or waived. Often this is promotional and should be viewed as a pricing decision rather akin to "buy-one-get-one-free". On these occasions, the consumption is not treated as a transfer even though conceptually it could be considered as one. Rather the situation is incorporated as a price change. Some DIP business models include the payment of a rebate to consumers who purchase through the platform. Again, this should be considered as an adjustment to the market price paid (SNA §3.121) rather than an additional flow between DIP and consumers.

Annex Table 4.B.3. DIS paid solely by producer

	Buyer	Seller	DIP	Total
Output		100	12	112
Intermediate consumption		52	4	56
Of which				
Goods and services used for production		40	4	44
Intermediation service fee		12		12
Gross Value Added		**48**	**8**	**56**
Household Final Consumption	**100**			**100**
Of which				
Intermediation service fee	0			
Paid to seller	100			

The total amount of Household Final Consumption and Gross Value Added is the same, regardless of if the fee is paid by both the producer and the consumer, as in the first example, or solely by the producer, as in the second example.

5 Digital industries (the “who”)

The Digital Supply and Use Tables (SUTs) extend the industry dimension of conventional SUTs by classifying based on how the producers are using digitalization to interact with consumers. The framework defines seven new digital industries, beyond those in existing formal classification structures, allowing for new aggregations of output, gross value added to be created.

Introduction

Chapter 1 notes that digitalisation has affected every industry within the supply and use framework, from the inputs used in production, to the way that the products are marketed and sold. It is for this reason that the Digital Supply and Use Tables (SUTs) framework presented in Chapter 2 includes the transaction and product perspectives (the "how" and the "what") in addition to the activity or industry perspective (the "who") discussed in this chapter. The transaction split (Chapter 3) can provide an insight into the level of digital ordering and delivery within a conventional industry, while the product perspective (Chapter 4) sheds light on the growth in Information and Communication Technology (ICT) goods and digital services consumed by businesses and households.

This chapter presents the seven new "digital industries" that are separately identified in the Digital SUT framework. These industries are not shown separately in the International Standard Industrial Classification (ISIC), but the economic units (companies etc.) that belong to them are included within established ISIC industry categories, and they are part of the conventional SUTs and related indicators. The Digital SUT framework clusters economic units in a way that is designed to highlight their role in digitalisation. This allows for traditional industry-based macroeconomic indicators such as output, gross value added (and its components such as gross operating surplus and compensation of employees) to be produced from a digitalisation perspective rather than with traditional economic activity breakdowns.

The chapter first provides detail on the definition and characteristics of each of the seven digital industries within the Digital SUT framework. For each digital industry, it also explains the benefits of separately identifying it. The chapter then reviews some of the early work that countries have undertaken to estimate the high priority indicators associated with the digital industries. It also discusses how the changes to the ISIC (from Revision 4 or "Rev. 4" to Revision 5 or "Rev. 5") will affect the compilation of the Digital SUT industries.[41]

As digitalisation plays a bigger role in the economy, policy makers need information on the level of valued added and its contribution to economic growth coming from "digital" businesses. The digital industries presented in this chapter are considered significant enough to measure and to be of interest to policy makers. However, this may change over time as the digital economy continues to evolve. Changes may be made in the future either to remove from the Digital SUT framework industries that do not provide analytical interest to users; or to include additional industries that become fundamental to the digital economy.

The seven digital industries discussed in the next section of this chapter are included as additional columns in both the supply and use tables. They are:

1. The digitally enabling industry.
2. Digital intermediation platforms (DIPs) charging a fee.
3. Data- and advertising-driven digital platforms.
4. Producers dependent on DIPs.
5. E-tailers.
6. Financial service providers predominantly operating digitally.
7. Other producers only operating digitally.

[41] While this chapter will reference ISIC, this can be interpreted as the corresponding industry classification used in respective regions (NACE in Europe, NAICS in North America etc.).

The seven digital industries – concepts and definitions

1. The digitally enabling industry

The digitally enabling industry is made up of units that produce goods and services that enable the digital transformation to occur, such as IT equipment and software. In discussions with the Informal Advisory Group (IAG) on Measuring GDP in a Digitalised Economy, there has been a consistent desire to identify such facilitators of the digital transformation. For example, the "tiered" structure of the digital economy proposed in the G20 Roadmap toward a Common Framework for Measuring the Digital Economy (OECD, 2020[6]) included a "core measure", made up of producers of ICT goods and services. As digitalisation spreads, the production associated with facilitating and enabling digitalisation is considered key for understanding its impact and analysing future trends.

This group is different from the other digital industries in that units are assigned to this industry based on the activity they are undertaking (and the good and service they are producing) rather than how they leverage the digital transformation.

Within the Digital SUT framework, the digitally enabling industry consists of producers for which their primary production is facilitating digitalisation. This definition builds on that of the ICT sector in ISIC Rev. 4, which is: *"The production ([of] goods and services) of a candidate industry must primarily be intended to fulfill or enable the function of information processing and communication by electronic means, including transmission and display"*. (UNSD, 2008[24])

For simplicity, it was decided to align the digitally enabling industry with the ICT sector in ISIC Rev. 4, as many statistical offices already have surveys and outputs in place consistent with this this definition (Eurostat, 2022[32]). This should make compilation of estimates straightforward.

The list of ISIC Rev. 4 categories (Table 5.1) spans a wide range of activities, from the manufacture of ICT goods to the delivery of telecommunication and information technology services. It was initially constructed in 2007 by the OECD Working Party on Indicators for the Information Society (OECD, 2007[89]) as a way of defining the digital economy. It is now considered too narrow as a definition of the digital economy,[42] but it is useful for measuring the digitally enabling industry.

[42] For instance, while it was included as a "core measure" of the digital economy in the G20 Roadmap, the Roadmap also included two additional tiers: producers who rely on digitalisation and producers who are enhanced by digitalisation. (OECD, 2020[6]).

Table 5.1. ICT sector as defined in the ISIC Rev. 4

ISIC Sub-division	Industry description
	ICT manufacturing industries
2610	Manufacture of electronic components and boards
2620	Manufacture of computers and peripheral equipment
2630	Manufacture of communication equipment
2640	Manufacture of consumer electronics
2680	Manufacture of magnetic and optical media
	ICT trade industries
4651	Wholesale of computers, computer peripheral equipment and software
4652	Wholesale of electronic and telecommunications equipment and parts
	ICT services industries
5820	Software publishing
6110	Wired telecommunications activities
6120	Wireless telecommunications activities
6130	Satellite telecommunications activities
6190	Other telecommunications activities
62	Computer programming, consultancy and related activities
6201	Computer programming activities
6202	Computer consultancy and computer facilities management activities
6209	Other information technology and computer service activities
631	Data processing, hosting and related activities; web portals
6311	Data processing, hosting and related activities
6312	Web portals
951	Repair of computers and communication equipment
9511	Repair of computers and peripheral equipment
9512	Repair of communication equipment

Source: (UNSD, 2008[24]).

2. DIPs charging a fee

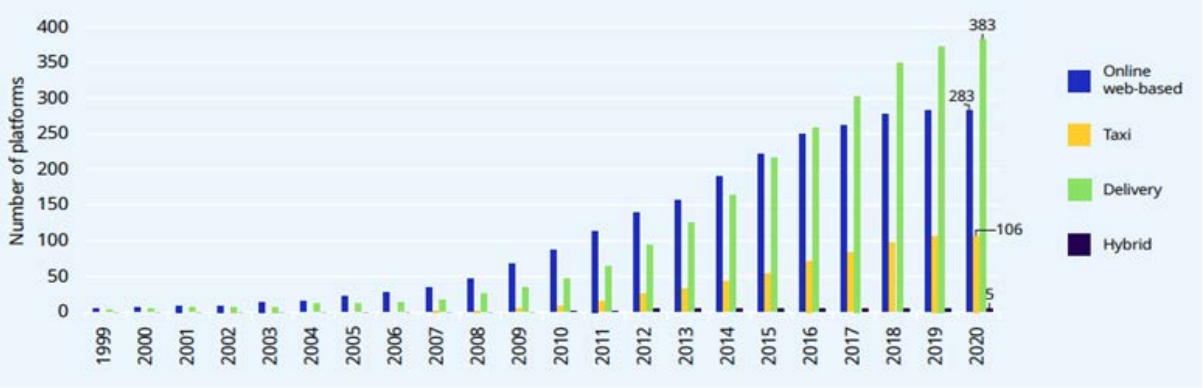
The emergence of digital intermediation platforms (DIPs) for buying and selling products is one of the most visible changes brought on by the digital transformation. DIPs provide an avenue for producers to interact with a larger number of potential consumers (including those in other geographical locations) at relatively low cost, lowering the barriers to entry and bringing in producers previously excluded from the market. At the same time, DIPs act as a form of commission agent for many producers, give consumers far greater ability to compare prices and quality of products and services and collect large amounts of information. In short, they match supply with demand, facilitating and structuring online transactions" (OECD, 2019[90]). Some well-known examples of DIPs are auction sites and independent booking sites for travel. Although platforms facilitating peer-to-peer (P2P) lending transactions and crowd funding share some similarities with DIPs (e.g. limited financial risk, charging a fee for a service), it was considered more appropriate to place these types of platforms in "financial service providers predominantly operating digitally" rather than DIPs charging a fee.

When a transaction goes through a DIP, both sides of the transaction derive economic benefits despite the fee charged for the intermediation service by the DIP. This is one of the main reasons that DIPs are now so popular, facilitating the buying and selling of all kinds of products and services. Evidence of this

is shown by an ILO study of a subset of DIPs known as "digital labour platforms" (ILO, 2021[91]).[43] The number of such platforms increased by around 400% between 2010 and 2020 (Crunchbase database, as cited by ILO, 2021[92]). Figure 5.1 shows the main types of digital labour platforms and their increase over this period.

Figure 5.1. Number of active digital labour platforms globally 1999-2020, selected categories

Number of platforms



Note: Only currently active platforms are included.
Source: (Crunchbase database, as cited by ILO, 2021[92]).

DIPs are defined by the IAG on Measuring GDP in a Digitalised Economy as:

> *Business that operate online interfaces that facilitate, for a fee, the direct interaction between multiple buyers and multiple sellers, without the platform taking economic ownership of the goods or rendering the services that are being sold (intermediated).*

This definition focuses on two important components that separate out DIPs from other online platforms as well as from traditional retail and wholesale activity. These are:

- The charging of a fee for facilitating a transaction.
- The absence of economic ownership of the product or service by the business facilitating the transaction.

The first point separates DIPs from the broader group of online platforms. DIPs do not include social media and platforms that provide services free of charge.

In 2019, the OECD, after extensive consultation, proposed a broad definition of online platforms as "a digital service that facilitates interactions between two or more distinct but interdependent sets of users (whether firms or individuals) who interact through the service via the Internet" (OECD, 2019[90]).[44]

[43] While digital labour platforms are a large subset of the broader DIP industry, other DIPs also exist such as those that facilitate transactions in goods (such as clothing, electrical items etc.) as well as accommodation services or tickets to an event, where the consumer must be at a specific location to receive the service.

[44] See "An Introduction to Online Platforms and Their Role in the Digital Transformation", OECD Publishing, Paris, https://doi.org/10.1787/53e5f593-en). Additionally, this definition makes a split between platforms and e-tailers and producers supplying services digitally by adding that the definition "*excludes businesses such as direct business-to-consumer (B2C) e-commerce and ad-free content streaming, as those serve only one set of customers. It does,*

However, this definition is for all digital platforms including those that are beyond the scope of DIPs. An "interaction" might simply be communication between two parties or an exchange of information. What separates DIPs from the broader group of online platforms is the charging of an explicit fee in exchange for facilitating a "transaction" as defined by the System of National Accounts (SNA).[45] The charging of a fee creates a transaction in itself, and it also confirms that there is a transaction between the producer and the consumer.

Online platforms that do not facilitate an interaction that creates value added or do so but do not charge a fee to the producer or consumer must be generating revenue via other means. This is most likely from selling advertising space on their platform or selling analysis based on the data they produce from the interactions on the platform. Within the Digital SUT framework, the units that operate these platforms should be classified to data- and advertising-driven digital platforms.

The second point confirms that the DIP is not acting as a retailer or sub-contractor. Since the good or service that is exchanged as part of this transaction is not produced or owned by the DIP, the output and associated value added of the underlying product remain with the producer. The DIP's role is to match the producer with the consumer, which is done in exchange for the fee, usually paid for by the producer and recorded as intermediate consumption.[46]

A global consultation on DIPs undertaken as part of the update to the 2008 SNA confirmed these two characteristics as being fundamental to the definition of a DIP[47] (ISWGNA, 2022[87]). Descriptions of similar characteristics such as "leaving control rights with the supplier" and the ability to "adapt their price structures by levying different membership and usage fees on each side of the market" have also been discussed previously in different contexts (OECD, 2018[93]), (OECD, 2019[94]).

A final consideration on these two defining characteristics is that this appears to be how DIPs view themselves. Lyft, one of the largest rideshare platforms, described their business model in their 2021 annual report in the following terms:

> *We facilitate the provision of a transportation service by a driver to a rider (the driver's customer) in order for the driver to fulfil their contractual promise to the rider. The driver fulfils their promise to provide a transportation service to their customer through use of the Lyft Platform. While we facilitate setting the price for transportation services, the drivers and riders have the discretion in accepting the transaction price through the platform. We do not control the transportation services being provided to the rider nor do we have inventory risk related to the transportation services. As a result, we act as an agent in facilitating the ability for a driver to provide a transportation service to a rider. (LYFT, 2021[95])*

This clearly shows that Lyft does not consider itself as taking ownership of the services provided. It sees itself as facilitating the transaction by acting as an agent.

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however, include businesses such as third-party B2C e-commerce and ad-supported content streaming, because those services involve two separate sets of users".

[45] The SNA defines transactions as *"an economic flow between institutional units by mutual agreement"* with an economic flow representing *"the creation, transformation, exchange, transfer or extinction of economic value"* (UNSD, Eurostat, IMF, OECD, World Bank, 2009[18]). Many interactions via platforms do not include the economic flow components as no economic value is created, transferred or exchanged.

[46] The recording of transactions associated with DIPs is discussed further in Chapter 4.

[47] The support for this was near unanimous, with 49 of the 52 responders agreeing that the charging of an explicit fee for digitally facilitating an economic transaction between two independent parties and not taking economic ownership of the goods and services ultimately sold to the consumer were fundamental characteristics of a DIP.

It is worth noting that production from DIPs is already included in GDP. The concern for users is the lack of visibility of this contribution. This is partly due to two classification challenges affecting the measurement of DIPs.

The first of these challenges regards the product that these units are producing. This is because the current version of the CPC only addresses certain aspects of intermediation services (see Chapter 4).

The second challenge is a lack of consistency regarding where the activities of DIPs are currently classified. Recommendations on the classification of DIPs ('intermediaries' in the recommendations) were released in September 2017, as temporary guidance to supplement ISIC Rev. 4. The guidance said that if an appropriate support or agency class exists, the unit "is classified to the industry of the specific activity (e.g. travel agent, reservation service)". If such a support or agency class does not exist, then it should be classified to "the industry of the principal [good or service they are intermediating] (e.g. telecommunications for selling telecommunication services on a commission or fee basis)" (Murphy, 2017[96]).

Since these recommendations were not part of a full update of the ISIC, it is unclear how much they have been implemented. Additionally, since most countries do not publish SUTs below the ISIC Division level, the specific output and value added from these DIPs are likely to be invisible within the national account aggregates as they make up only part of the Division. However, as discussed later in the chapter, ISIC Rev. 5, which was endorsed in early 2023, provides greater clarity to countries on how to classify DIPs in the future.

3. Data- and advertising-driven digital platforms

The data- and advertising-driven digital platforms industry includes all units operating exclusively as digital platforms whose main source of revenue is either the sale of data produced using information collected from the platform and/or the sale of advertising services using the platform for advertising.

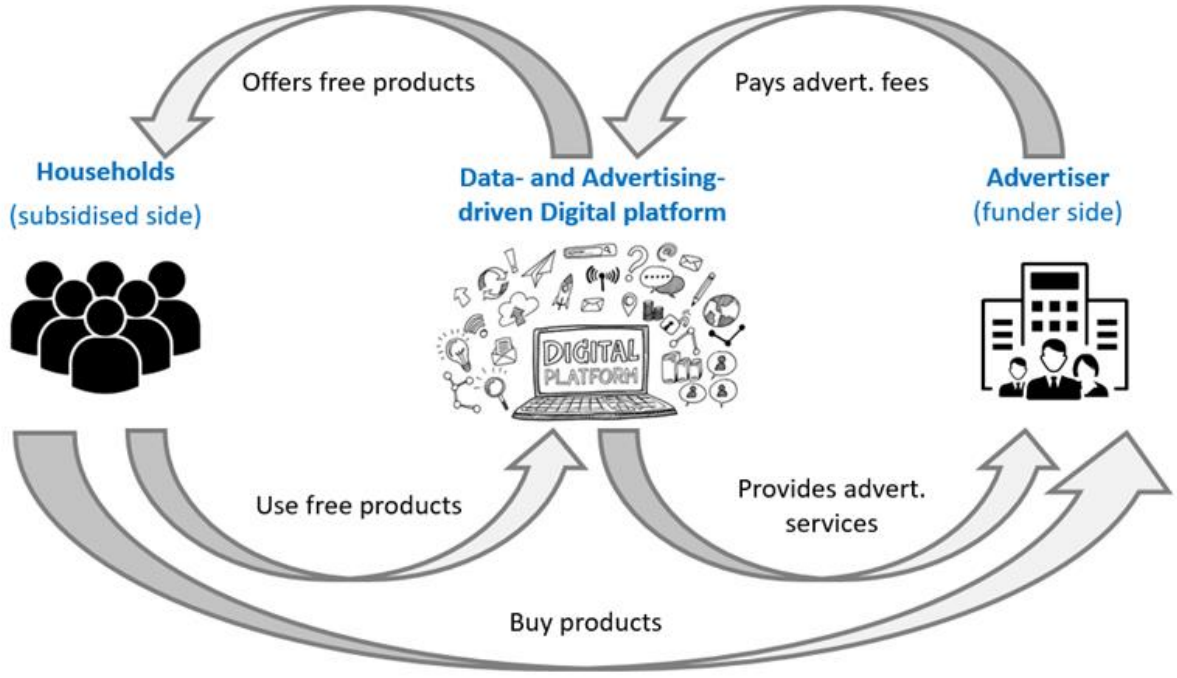
To generate both eyeballs for advertising[48] and information for data, platforms must produce digital services to attract people. These digital services are provided to users free of charge, so the business model of this digital industry differs from the standard producer-consumer paradigm.[49] If a business is charging the consumer for the service they are providing, they do not meet the definition of data- and advertising-driven digital platforms.

Figure 5.2 shows how this business model revolves around revenue from sales in (usually) advertising or data analytics to third parties cross subsidising the cost of providing the free service. The better the free services, the more the likely the platform is to attract advertising and increase data services sold. This business model and how it is represented in the national accounts are described in detail in the SNA guidance note covering the treatment of free digital products (ISWGNA, 2022[97]).

[48] Eyeballs are views of the advertising content by visitors to the platform. It is also possible to listen to an advertisement, rather than viewing it, as would be the case with free podcasts.

[49] Conventional businesses may also provide "free services". Often this takes the form of sponsorship or other expenditure paid for as part of marketing; but the main source of revenue in such business models remains charging for goods and services.

Figure 5.2. Cross-subsidisation of data- and advertising- driven platforms



Note: Advertising can be purchased by the Government or non-profit institution serving households (NPISH) sectors in the national accounts, which generate revenue in ways that may not include buying products.
Source: (Eurostat, 2023[98]) – adapted.

Examples of data- and advertising-driven digital platforms include search engines, web mapping platforms, public transport applications, mobile wallets, information sharing (e.g. sport results) applications, social media and social networking sites. Such platforms offer a huge range of services to consumers, and since they are likely classified with other units that undertake similar activities (but charge for the service) rather than with the activity from which they derive revenue, they are likely to be classified across a range of conventional industry classifications.[50]

Cross-subsidisation business models have previously been used for other types of published content such as newspapers and TV. However, the proliferation of platforms operating like this means that there is now a large amount of labour and capital investment associated with producing content consumed by households as free digital services. This is not recorded as part of household consumption in the national accounts. Also, while the output produced by this labour and capital investment is still recorded as consumed by entities (intermediate consumption as input into other production), generating an estimate of the specific inputs contributing to this consumption of free digital services would be of interest for productivity measurement.

The extension of the Digital SUTs into a fuller Digital Economy Satellite Account (see Chapter 1) may involve estimating the value of these free products. A guidance note produced as part of the process of

[50] These units may go against the primary classification guideline outlined in ISIC, which is that the "principal activity of the unit should be determined with reference to the value added to the goods and services produced." The value added that these platforms are providing are services such as advertising or data analytics; however, they are unlikely to be classified as such. ISIC provides the option to classify based on other criteria such as the activity that the majority of workers is undertaking (UNSD, 2008[24]).

updating the 2008 SNA summarises options for recording and valuing cross-subsidised digital products and services in a satellite account (ISWGNA, 2022[97]). It concludes that it would be useful to identify the units that provide mainly free digital services and develop estimates of such services.

4. Producers dependent on DIPs

Producers dependent on DIPs are units that sell most of their goods or services via intermediation platforms. For the Digital SUTs, these units will be placed in this industry regardless of the good or service they are producing. They will be re-allocated from the activity-based classification in the ISIC if most of the demand for their products comes from a DIP. This industry may include both commercial enterprises (firms) and individuals (independent contractors or workers).

Whereas the output and the value added of the DIP industry consists of only the intermediation service product (see Chapter 4) associated with facilitating the transaction, for "producers dependent on DIPs", the output and value added of the industry comes from the amounts they make via DIPs.

Individual workers or independent contractors in this industry usually source their business from DIPs that focus on types of products that can be produced by a single person. The International Labour Organization (ILO) refers to these DIPs as "digital labour platforms" (see **DIPs charging a fee**). While the platforms themselves would be classified in the DIP industry, the people who work with them should be classified in the industry "producers dependent on DIPs".

DIPs simplify the process of entering the workforce and provide opportunities for workers and firms to broaden their markets, potentially leading to increases in workforce participation and better outcomes for workers and the clients who engage them. Such benefits have seen a rapid expansion in those generating work via online platforms. For example, in England and Wales, the percentage of the working population who found work via a platform at least once a week has increased from 5.8% in 2016 to 14.7% in 2021 (Figure 5.3). However, as pointed out by the ILO, this rapid change also creates challenges and specific concerns, such as regularity of work and income, working conditions and social protection (ILO, 2021[91]). As the contribution of this sector to the economy increases, there will also be a need for policy interventions including regulation. For example, a review undertaken by the Conference of European Statisticians (CES) in 2022 found "that there is strong interest among policy makers and researchers across the CES region for data on new forms of employment, particularly digital platform employment" (UNECE, 2022[99]). Therefore, the compilation of accurate and visible estimates for this sector is important.

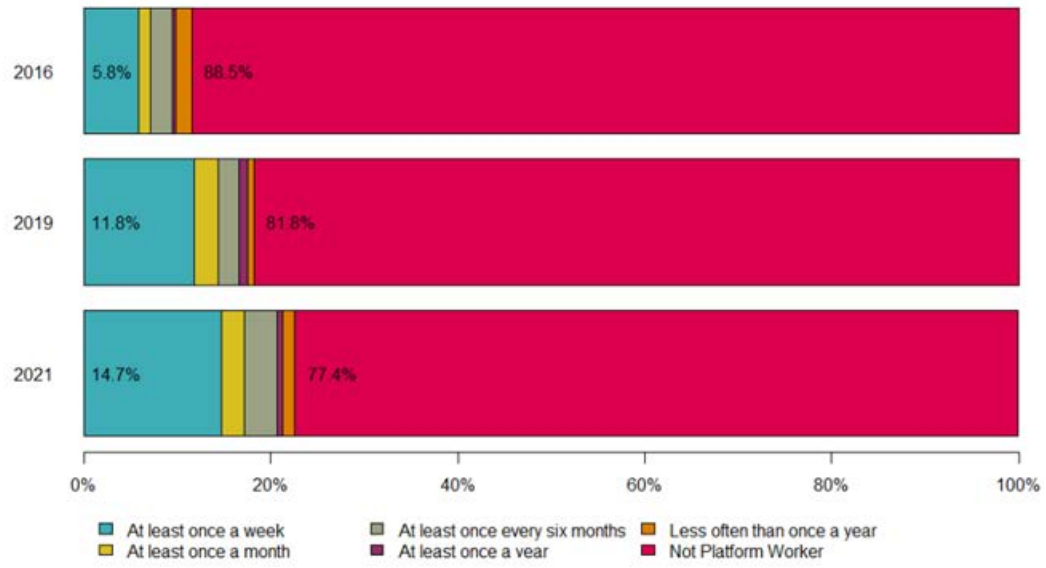
Digital labour platforms can be further broken down into two different types (ILO, 2021[91]):

- **Online web-based platforms**, where tasks or work assignments are performed online or remotely by workers, before being (digitally or physically) delivered to the client (the user of the digital platform).
- **Location-based platforms**, where tasks or work assignments are carried out in person in specified physical locations by workers.

Although this breakdown is not part of the Digital SUT framework, countries may also decide to include these two categories in their Digital SUTs.

Figure 5.3. Proportion of people who did work found via an online platform in England and Wales, 2016-2021

% of working age population (age 16-64)



Source: (Spencer and Huws, 2021[100]).

5. E-tailers

E-tailers is defined as traders engaged in purchasing and reselling goods who receive most of their orders digitally.[51] This industry has the same characteristics and definitions as the traditional ISIC Rev. 4 category of "retailers and wholesalers", except for the digital ordering element.

Online shopping developed early in the digital transformation. Consumers who previously had to be in the same physical location as the retailers were able to browse and purchase goods from anywhere in the world. From the retailer's point of view, online retailing reduces costs due to the absence of physical locations and opens additional markets. Because of these benefits, many traditional retail businesses that were buying products wholesale and reselling them physically to final consumers now do so entirely online. Others have developed as online-only retailers.

Separating out the units based on the method of ordering, even when they are undertaking the same fundamental activity, will provide insight into policy questions. While some research has shown that there is a limited difference between the price of products sold online and in store (Cavello, 2017[101]), the production and business models of online and in store retailers are different. For that reason, there is a clear user interest to see results separately, obtaining insights into how the specific business models may affect important indicators such as retail margins, operating surplus and the output-to-intermediate consumption ratio.

Almost all retailers in high income countries offer some form of e-tailing option. However, moving all units that offer this service to the new digital industry would mean just replacing the existing retail industry. At the same time, the IAG on Measuring GDP in a Digital Economy did not believe it was

[51] This "majority" is from the perspective of value of sales. That is, a unit is an e-tailer if the value of their sales via digital ordering makes up most of their total sales.

helpful to limit the definition of the e-tailers to units operating exclusively online. The IAG decided instead to define e-tailers as those units for which a majority of orders, in terms of value, are being received digitally. Such a definition will need to be approached with common sense and pragmatism, in the same way as units that undertake multiple activities are classified currently. It would be counterintuitive if units were to move back and forth between the proposed e-tailer classification and the existing retail industry depending on whether they were just over or just under the 50% value threshold. Additionally, materiality and resource availability will also dictate when such a move is made. It may not be practical for compilers to check all units within the retail industry every year to ensure that they are classified correctly, but this may not be necessary if the retailer contributes a very small amount to the industry. Rather, it is envisioned that compilers would move units into the e-tailer classification once this method of transaction becomes the predominant source of demand, with perhaps a higher bar considered if the unit is a particularly large contributor.

6. Financial service providers predominantly operating digitally

This industry contains financial service providers, including insurance, reinsurance and pension schemes/funds, which are operating predominantly online, with limited or no avenues to interact with consumers physically. It also includes financial platforms that facilitate digital peer-to-peer (P2P) lending and crowd funding.

In the national accounts, financial service providers belong to the Financial Corporations sector. In the ISIC Rev. 4, they are classified in Section K: Financial and insurance activities. For the Digital SUTs, financial service providers are part of the industry known as “financial service providers predominantly operating digitally” if they predominantly transact with consumers via digital channels.

Although consumers may be able to order a specific service directly from the producer, often within this industry the services are provided without direct contact between the producer and the consumer. Interactions with the service provider can take varied forms such as, for banking: using a credit card, an ATM (cash machine), an in-person consultation, making and receiving automatic transfers; for insurance: purchase of an insurance policy on an insurer’s website; or for asset management: selecting and buying funds on a platform provided by the asset manager.

In some cases, institutional units within this industry are exclusively digital. Many such units are associated with “Fintech”, a concept which is generally understood to be about financial services involving innovative new (digital) technologies.[52] Examples of Fintech are robo-financial activities, online asset management platforms, P2P lending, crowdfunding, payment services, digital-only banks, InsurTech and PensionTech.

On the other hand, many units in the Financial Corporations sector of the national accounts engage in both physical and digital supply of services. Most banks, for example, still have high-street branches, even though much of their business nowadays is conducted online. For some banking activities there is no explicit charge to the consumer at the time of the service, leading to output being measured implicitly. If compilers cannot calculate a defined percentage of digital ordering that would result in a unit being considered digital, the decision on whether to include the unit in this industry should be based on determining whether the predominant way that the unit transacts with consumers is digital.

The IAG discussed the option of making the definition of this industry exclusively (rather than predominantly) digital. However, it was considered that such a narrow definition may exclude units

[52] Fintech is of considerable interest to policy makers, although there is no internationally agreed definition. Work to agree on definitions and classification approaches is ongoing, for instance as part of the third phase of the G20 Data Gaps Initiative, https://www.imf.org/en/News/Seminars/Conferences/DGI/g20-dgi-recommendations#dgi3

which for all intents and purposes are operating digitally, including those providing insurance and pensions.

As in the case of e-tailers, the recommendation to use the "predominance" principle implies some subjectivity on the part of compilers; but this is not unusual in national accounts classification decisions. As more countries produce outputs associated with this industry, the feasibility of its compilation and comparability across countries will be able to be tested, as will the analytical usefulness of the estimates in relation to emerging policy requirements and user needs. In the future, inclusion in this industry may be based on some other characteristic of digitalisation beyond digital ordering or delivery. Additional changes, if required, can be made at this time.

7. Other producers only operating digitally

This industry is made up of units operating exclusively online that are not included in one of the previous six digital industries. It includes businesses that produce their own goods and services and interact with consumers in an exclusively digital manner. All ordering within this industry would be considered as digitally ordered, and all services within this industry would be considered digitally delivered.[53] This industry is defined as exclusively digital in order to maintain its analytical usefulness and interpretability. While many producers have a significant digital component in their interactions with consumers,[54] it was considered more useful to users to limit this industry to so called "digital natives" whose business model is based on digitalisation.

This industry may include any unit producing a service that is considered digitally deliverable (see Chapter 3). Examples include producers providing digital content on a subscription basis (such as digital newspaper subscriptions and audio or visual content subscriptions), online gaming and gambling services, as well as more traditional services (such as legal or accounting services) that only have a presence online.

However, the industry should exclude units that interact with consumers digitally as well as physically. For example, it would include universities and other tertiary education providers that interact with students entirely online, where students do not have the option to attend physically and must receive their education service digitally; but it would exclude education providers that offer online courses in addition to physically attended courses.

Similarly, it should exclude newspaper publishers that sell newspapers through physical outlets such as shops and newspaper stands as well as selling via digital newspaper subscriptions, since the publisher is interacting with consumers both digitally and physically. However, if a newspaper only sells its product via digital subscriptions, it should be included in this industry even if the newspaper is delivered to the home or office of the online subscriber.

In many ways, these businesses are like the data- and advertising-driven platforms, in that they are providing a wide variety of services to the consumer in a digital manner. The difference is the business model, in that the data- and advertising-driven platforms are subsidised by revenue from other sources, whereas the units contained within "other producers only operating digitally" are explicitly charging the consumer for the service provided.

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[53] Since goods are not able to be digitally delivered, a firm may still be considered as exclusively operating digitally if they are receiving all orders digitally but physically delivering goods.

[54] Including a large amount of non-market producers. Interactions with the government on issues such as taxation, visa applications and social welfare are now often (although not exclusively) conducted through digital channels.

In some cases, this may be thought of as a residual class, ensuring that all businesses operating exclusively in a digital manner are captured in one of the digital industries.[55] For example, most producers only operating digitally are likely to be collecting data. If this is a by-product of their main activity, they should be in the "other producers only operating digitally" industry, rather than in the data- and advertising-driven platforms industry.

Methods and sources used by countries to estimate outputs associated with digital industries

Undertaking compilation of industry outputs

The Digital SUTs are about reallocating production that is already contained in the national accounts and conventional SUTs in a way that provides insights into the digital economy. Output and the components of value added (compensation of employees, gross operating surplus and mixed income) for each of the seven digital industries need to be reallocated from the industry aggregates of the conventional SUTs. It should be noted that the coverage of the conventional SUTs includes informal units such as undocumented workers and businesses not formally reporting their income from certain productive activities. Such units are included within the SNA production boundary, so the output of these units may also be reallocated alongside the formal units. In some cases, estimates representing the informal sector may require updating due to the increasing role of digitalisation in the economy.

As outlined in Chapter 2, in the initial stages of the development of the Digital SUTs, the high priority indicators associated with the digital industries are: output, gross value added (GVA) and the components of GVA: compensation of employees, gross operating surplus and mixed income. In time, additional estimates connected to labour (i.e. number of employees and/or hours worked) and capital formation may be introduced. The ease with which additions can be made may depend on the compilation (or re-allocation) strategy implemented.

Based on the initial attempts to produce estimates, the compilation methods for deriving the high priority indicators associated with digital industries fall into two categories. Within the handbook these are referred to as:

- **Reallocation of specific units:** where specific units are identified as matching the criteria of the new digital industry and estimates of output, intermediate consumption and value added associated with these units are moved to the new industry.
- **Aggregate reallocation based on indicators**: where specific units cannot be identified, aggregated estimates associated with the production of these units is calculated using alternative indicators. The aggregate amounts can then be deducted from existing industry classes and moved to the new industry.

Based on a review of early compilation attempts, it appears that the digitally enabling industry and DIPs charging a fee favour compilation by reallocation of specific units across industries, while e-tailers and producers dependent on DIPs are more easily compiled using the indicator method. However, no choice is correct or incorrect and the choice of method (including any other method not yet documented) applied by countries should be undertaken based on a range of reasons, including statistical infrastructure, available resources and source data availability.

[55] Units should be placed in this industry if they are exclusively digital and do not meet the definition of one of the previous six digital industries.

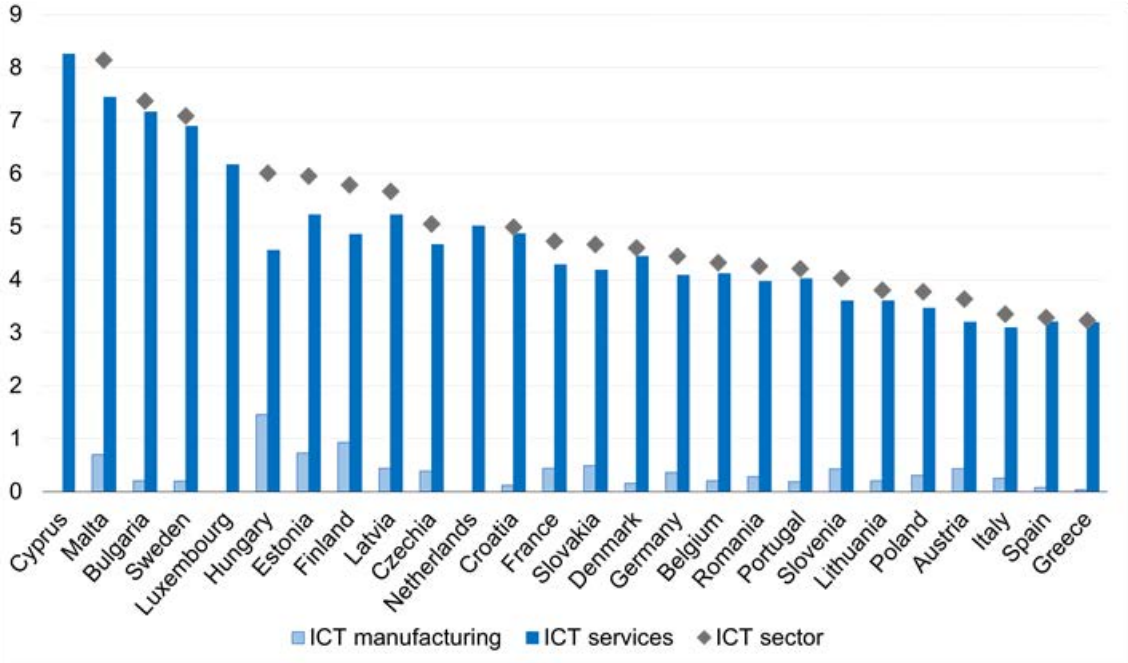
Compilation of digital industries based on reallocation of specific units

To reallocate specific units, first it is necessary to identify the units. If the businesses that meet the characteristics of the new digital industry are already in the business register or other sampling frames and already being surveyed as part of traditional surveys, it should be straightforward to identify the units that should be reallocated. However, this may be a non-trivial task where the registers are large and complex. The sampling strategy of the surveys used to produce the estimates may also need to be re-designed to provide sufficiently robust estimates for the new industries (and of the existing ones after removing the reallocated units).

For the digitally enabling industry, the separation of the units has already been undertaken in many countries (Figure 5.4) because the definition of the new industry is aligned with the ICT sector in ISIC Rev. 4 (see **the digitally enabling industry**). While Figure 4 only covers Europe, estimates of value added for the ICT sector are also available for many other countries.

Figure 5.4. Value added for the ICT sector in the EU, 2020

% of GDP

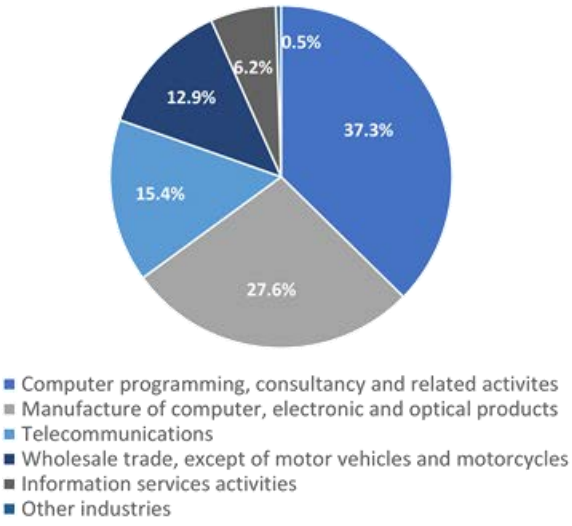


Notes:
For Spain, data is for 2018; for Estonia and Italy, data is for 2019.
Data for Belgium, Germany, Greece and France is provisional.
The following results have been supressed to protect confidentiality: ICT manufacturing and ICT sector for Cyprus, Luxembourg and the Netherlands; all results for Ireland.
Source: (Eurostat, 2022[32]).

As these estimates come from different conventional industry columns, further breakdowns showing the composition of the digitally enabling industry are possible. Figure 5.5 shows that over one-third of the output of the digitally enabling industry in the Netherlands comes from a single NACE division: *Computer programming, consultancy and related activities.*

Figure 5.5. Composition of the output of the digitally enabling industry, Netherlands, 2018

% of total



Note: The numbers in the category descriptions (e.g. 61 Telecommunications) refer to divisions of NACE, the statistical classification of economic activities in the European Community.
Source: (Statistics Netherlands, 2021[43]).

Statistics Canada followed a similar approach for the estimation of e-tailers in their Digital SUTs publication. Their approach re-allocated to the e-tailer industry units that were classified to the NAICS category of 454110 "Electronic Shopping and Mail-Order Houses" (Statistics Canada, 2021[102]). NAICS defines this category as *"establishments primarily engaged in retailing all types of merchandise using non-store means, such as catalogues, toll free telephone numbers, or electronic media, such as interactive television or the Internet"* (NAICS, 2017[46]). This category is likely to contain many units that fit the characteristics of e-tailers, but it may also include establishments that still require non-digital ordering. Additionally, almost all retailers now offer some form of digital ordering option, so it is likely that other units not classified to NAICS 454110 would also fit the definition of e-tailers within the Digital SUT framework. Therefore, the approach to e-tailers taken by Statistics Canada is not fully aligned with the framework. Nevertheless, it has the advantage of being straightforward to do and transparent for users, who understand that units that were classified as *X* are now classified as *Y*. Such approaches are still welcome, if they are accompanied by explanations on what may or may not be included in the estimates.

It is not always so straightforward to identify the specific units to be reallocated to a new digital industry. The digitally enabling industry is the only digital industry that is defined by a specific set of ISIC/NACE/NAICS categories. For the other industries, units must be identified based on whether they meet the characteristics of the new industries. So far, compilers have tried both systematic approaches as well as those based more on compilers' knowledge and research.

A systematic example was that undertaken by Statistics Netherlands to identify DIPs (See Box 5.1). The method involved training a machine learning algorithm to identify potential DIPs based on language used on their firms' websites. This produced a register of DIPs that allowed Statistics Netherlands to run a DIP survey. The survey was designed first to confirm that the business did operate a DIP (as

defined in the Digital SUT framework) and then to collect the specific information required for the high priority indicators for the DIP industry.

Box 5.1. Identification of online platforms by web scraping

Statistics Netherlands has derived a register of DIPs in a systematic way using web scraping. The first step was to identify key words that were likely to be present on a DIP website, such as: "register", "login", "platform", "sign up". The key words were found on websites of platforms that had already been manually identified by the staff of Statistics Netherlands. Using a list of companies from the country's business register, the web scraping tool then scraped through websites of businesses with a ".nl" domain. This had the advantage of aligning the register of DIPs with the business register; but it also meant that any new platforms not yet included in the business register would be excluded from the DIP register.

Based on the prevalence of the words on the website, each website was given a score between 0 and 1 based on the possibility of the unit being a DIP. After reviewing over 600,000 websites, it was decided that those with a score of 0.8 or higher would be considered for inclusion in the DIPs survey. A manual review reduced the number of potential units by around half (Table 5.2). This component of the work was resource intense but improved the quality of the register. It should be noted that over the three years that the model has been run, it has produced relatively stable results.

Table 5.2. Identifying DIPs in Netherlands: refinement process

Results	Number of businesses	%
Totally scraped (with text)	629,284	(100)
Probability ≥ 0.5	41,881	(6.6)
Probability ≥ 0.8	9,387	(1.5)
Questionnaire sent	4,385	(0.7)
Response provided	2,997	(0.5)
Considered platform company	537	(~0.1)

Importantly, this approach can be used for identifying other types of businesses, with promising results observed when for example asked to identify "innovative" companies, although a similar exercise for identifying companies using AI proved more problematic.

Source: (Statistics Netherlands, 2022[103]).

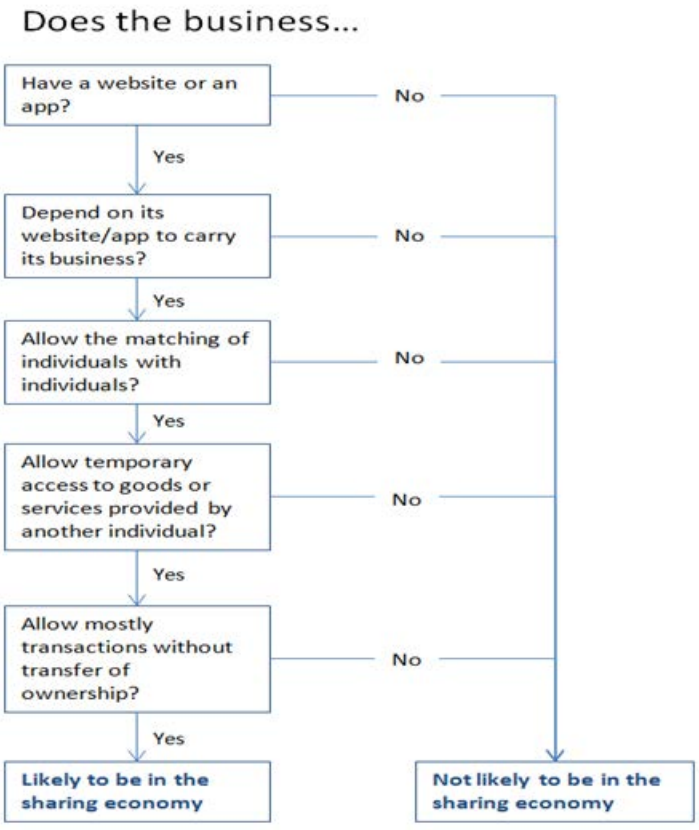
An alternative approach was undertaken by the UK Office for National Statistics (ONS) in response to concerns that elements of the "sharing economy" were not included in the country's economic indicators. The sharing economy was defined by the ONS as *"the sharing of under-used assets through completing peer-to-peer transactions that are only viable through digital intermediation, allowing parties to benefit from usage outside of the primary use of that asset"* (ONS, 2017[104]). While this work focused on the topic of the sharing economy rather than DIPs as defined in the Digital SUT framework,[56] the

[56] The ONS sharing economy definition is broader that then DIP definition in the Digital SUT framework. While DIPs in the framework charge a fee for facilitating the transaction, there is no such requirement for the sharing economy approach. A business may answer "yes" to each of the questions in the decision tree (Figure 5.6), but then derive their revenue from an alternative source, thus failing the definition of a DIP in the Digital SUT framework. It would,

method and challenges faced in their work are similar to those faced by countries attempting to identify DIPs.

By using the decision tree shown in Figure 5.6 to assess manually chosen businesses, the ONS identified an initial list of businesses involved in the sharing economy. This approach was time consuming and may have missed some businesses that should be included. Therefore, a more systematic approach was attempted using a key word search in the standard business register; but this still required a lot of manual checking and research.

Figure 5.6. ONS decision tree for identifying "sharing economy" businesses



Source: (ONS, 2017[104]).

The list of businesses produced by this decision tree was not intended to lead to a specific survey, but rather to ensure that existing surveys such as the Annual Business Survey could produce results for the sharing economy. The ONS then published indicators of how the sharing economy was impacted by the COVID pandemic (ONS, 2020[105]).

Although the ONS is now looking to update its definition of the sharing economy and is no longer using the specific decision tree shown in Figure 5.6, the approach is still an interesting one. It could be refined

however, be straightforward to adapt the decision tree to include an additional stage ensuring that outcomes are aligned with the DIP definition for the Digital SUT framework.

to produce indicators for DIPs as defined in the Digital SUT framework by including an additional question about the charging of fees.

A similar technique of identifying businesses that meet the definitions of digital industries in order to reallocate them to a new industry has been envisioned for other digital industries in the framework such as "financial service providers predominantly operating digitally" and "other producers only operating digitally". In these industries, there are likely to be a small number of large firms that fulfill the predominantly or exclusively digital requirements, allowing for easier identification and classification using decision trees.

However, based on compilation attempts so far, some challenges have been uncovered. As pointed out by Statistics Netherlands, while *"Many insurance and banking brands are promoted as online businesses, […] the brands or labels are owned and operated by a small number of very large business units that run both online and mixed models"* (Statistics Netherlands, 2021[43]). This means that compilers will need to make decisions about including borderline cases in the "financial service providers predominantly operating digitally" industry or excluding them.

A similar concern was highlighted when Statistics Netherlands attempted to identify "producers only operating digitally", where they concluded that *"most providers of online content are not necessarily digital only, and that (online) distribution and production of content are in most cases integrated in a single statistical business unit"* (Statistics Netherlands, 2021[43]). In this example, the focus was on the providers of online content. It needs to be further explored whether there are enough units meeting the definition of "other producers only operating digitally" to make this industry feasible to compile. Such learning experiences are important, not just to assist other countries hoping to undertake this kind of compilation, but also to continue to provide evidence on the feasibility of the current definitions for each of the industry.

While countries are still strongly encouraged to aim for estimates as consistent as possible with the agreed definition, it is possible that on occasions, some flexibility may be required. For instance, Statistics Canada in their outputs concluded that *"for practical reasons, the units classified here [to other producers operating digitally] are not required to generate 100% of their revenues from online activities but rather a large majority of their revenues is deemed a sufficient condition"* (Statistics Canada, 2021[102]). Therefore, while consistency with definitions and concepts is fundamental for meaningful international comparability, the ability for countries to actually produce estimates is equally important and as such, flexibility, accompanied by transparent metadata on how the estimates may differ from other countries, may greatly assist in the formation of initial outputs.

Box 5.2. The effect of ISIC Rev. 5 on the digital industries

In the ISIC and related classifications such as NACE for Europe and NAICS for North America, industry categories are designed around similarities in economic activity, not technology, as such a *"distinction between modern and traditional production methods is not a criterion for ISIC, although that distinction may be useful in some statistics"* (UNSD, 2008[24]). The final structure of the revised industry classification, known as ISIC Rev. 5, was endorsed in March 2023 at the annual meeting of the United Nations Statistical Commission (UNSC). ISIC Rev. 5 maintains this technology neutral perspective, whereby existing activities that are ordered or delivered via a new mechanism do not require a new classification (UNSC, 2022[51]).

However, new classifications are warranted where new technology has created new economic activities (or made previous activities large enough). This is the case for intermediation activities. Therefore ISIC Rev. 5 provides specialised classifications for activities associated with intermediation platforms. The final ISIC Rev. 5 structure includes 30 new classes or groups specifically created for the classification of units that facilitate *"transactions between buyers and sellers for the ordering and/or delivering of goods and services for a fee or commission, without supplying and taking ownership of the goods and services that are intermediated"* (UNSC, 2022[106]). These cover non-financial intermediation only.

Unlike the DIP industry within the Digital SUT framework, the change to non-financial intermediation in ISIC does not involve the aggregation of all intermediation platforms into a single category regardless of the product they are intermediating. Rather, the new classes are allocated to the division of the underlying economic activity being intermediated. Nevertheless, this change allows compilers to identify DIPs and aggregate the relevant outputs to compile estimates for the DIP industry in the Digital SUTs.

The source of revenue (e.g. explicit fee or advertising) does not come into consideration when classifying the unit for ISIC purposes. Therefore, when compiling the Digital SUTs, work will likely be required to separate the value added coming from DIPs (which facilitate a transaction as defined in the SNA and charge a fee to do so) from platforms that are providing the same intermediation service but deriving their revenue from data or advertising, making them part of the "data- and advertising-driven platform industry" in the Digital SUTs. Additionally, since the industry classification is agnostic to technology, the new classes may contain some traditional intermediation units undertaking the same activity (matching producers and consumers, for a fee) but without a digital platform. These units will need to be removed before compiling DIP estimates in the Digital SUT framework.

Other changes introduced in ISIC Rev. 5 may make it harder to compile estimates of digital industries. For example, in order to reflect the "new-normal" situation of most retail firms having both a physical and online mechanism for receiving orders (see Chapter 3), ISIC Rev. 5 has eliminated the distinction of retail trade activities according to the trade channel. This means that the distinction between "store" and "non-store" retailers (with the latter including a specific class for retail sale via mail order houses or via Internet) is no longer available. Compilers will either need additional steps to identify the relevant activities, or they will need to use indicators to apportion the aggregate retail estimates. However, the additional steps needed to identify *non-store* e-tailers will probably be needed anyway to identify the e-commerce business of *store* retailers.

Compilation of digital industries using aggregate reallocation based on indicators

As the creation of the Digital SUTs is a re-allocation rather than an initial compilation, it is possible to produce estimates for the new digital industries without identifying the specific units to which the values belong. Since all the output and value added associated with the new digital industries is already included in the output and value-added estimates of the conventional SUTs, once an estimate of the proportion belonging to the specific digital industry has been created, the amount can simply be deducted from the existing industries.

Such an approach is particularly useful for estimating the output of units that are hard to identify (such as producers dependent on DIPs) or where part of a conventional industry does not meet the definition of the new industry. For example, for estimating output related to e-commerce, the United States Bureau of Economic Analysis (BEA) uses a specific indicator, in this case online sales from the *Annual Wholesale Trade Survey* (United States Census Bureau, 2020[107]) and the *Annual Retail Trade Survey* (United States Census Bureau, 2020[41]), to determine the proportion of retail and wholesale margin that is associated with digital ordering. The BEA applies this proportion to the estimated retail and wholesale margin in the conventional SUTs (Bureau of Economic Analysis, 2022[47]). This estimate of "e-commerce retail margin" can be used as the basis for an initial estimate of gross output (and thus used to calculate GVA) for the e-tailer industry.[57]

Both the United States BEA and Statistics Canada include output that is not entirely consistent with the definition in the Digital SUT framework. Since the BEA's estimate is modelled using data from an indicator, it may include output from firms that may make only a minority of sales through digital ordering, and therefore are not e-tailers as defined in this chapter. The estimate from Statistics Canada, on the other hand, likely includes some legacy units from the NAICS category, that are not receiving orders digitally, as well as missing some traditional retail units (not classified to NAICS 454110) that are now receiving a majority of orders digitally. However, both approaches have been published with transparent methods allowing users to understand their scope, and both are a starting point for the estimates of the e-tailers industry.

A digital industry that contains particularly hard to identify units is "producers dependent on DIPs". Many of the producers are unincorporated or individuals acting as independent contractors. However, this very characteristic can be used as a potential indicator of activity. Statistics Canada made the reasonable assumption that people who were registering as independent contractors within the taxi industry were doing so solely in order to leverage the opportunities created by DIPs. After calculating the average revenue of a driver and multiplying this by the number of new registrations, they estimated the growth of output within this product and industry. This provided a timelier estimate than waiting until the new units had been added to the business register.

In many countries, producers that source demand through a DIP may not have undertaken the official registration process or been added to the business register. However, assuming that the methods used to include output from the informal sector are considered robust, the output from these units should still be included in the aggregates of the conventional SUTs.[58] It is simply a question of finding an appropriate indicator, source data or model in order to estimate aggregates and then re-allocate these

[57] It should be noted that this is a step not yet done by the BEA. In their existing publication on the digital economy, the BEA has so far focused on the product perspective.

[58] This assumption is an important one. Digitalisation has lowered the barrier of entry for many industries and, as such, many services that traditionally experienced very little to no output from the informal sector may now have such output. For example, couriers previously faced significant set-up costs, so it was in the business interest to register in order to claim tax deductions. Now any person with access to a bike share can earn money-delivering products, and there is less incentive to register officially.

aggregate estimates of output or value added into the new industry. The recently released Handbook on Measuring Digital Platform Employment and Work (OECD, ILO, European Union, 2023[108]) includes several recommendations to make it easier for statistical compilers to identify workers involved with digital platforms. While these are often based around labour surveys, knowledge of the amount and characteristics of workers and producers who are dependent on platforms is an important first step in modelling estimates of output and value added.

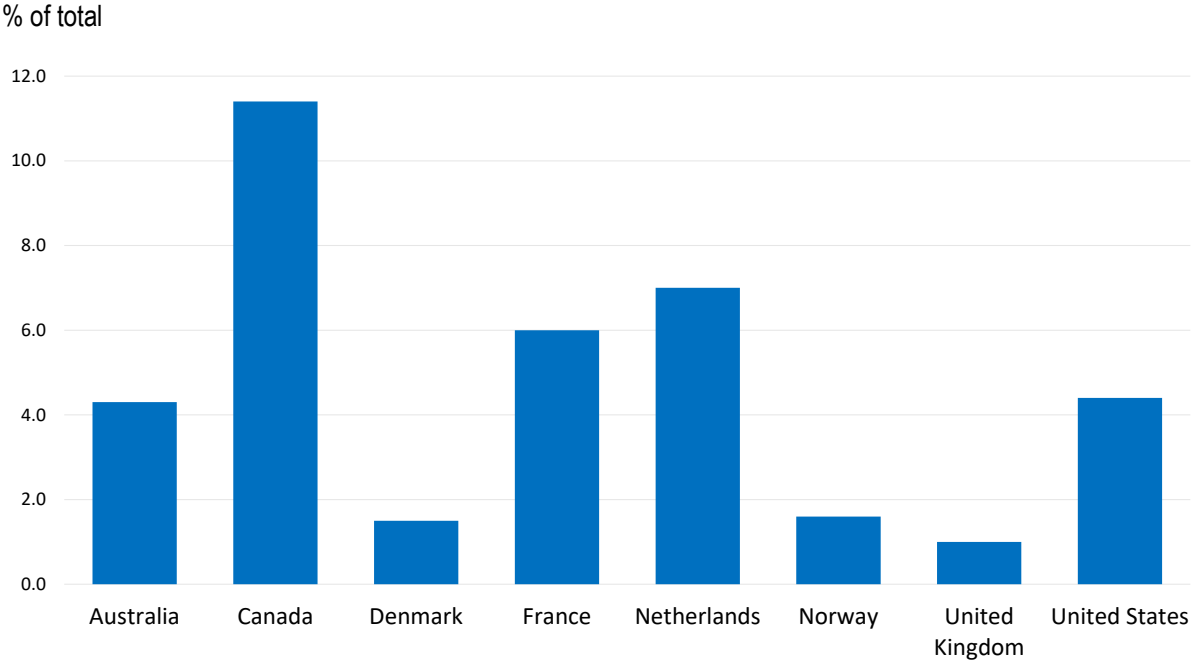
Another example of work in this area, concerns estimating the value added of accommodation services created through accommodation-sharing platforms like Airbnb. A joint OECD/BEA project presented at the fifth meeting of the IAG on Measuring GDP in a Digitalised Economy sought to compile estimates of value added from the use of Airbnb. Although many accommodation-sharing platforms exist, Airbnb is the most widely known and used.

Using only publicly available data combined with some basic assumptions, indicators consistent with the Digital SUT framework were produced. This included value added produced by the individuals (or firms) providing the accommodation service (Figure 5.7), household consumption of the total accommodation services facilitated by the DIP, and intermediate consumption of intermediation services provided by the DIP (see Box 5.3).

The project used data from the national accounts of countries and from privately constructed (but publicly available) sources. The publicly available data included the number of booked nights per year, average length of stay (nights), revenues earned by the host per year, ratio of Airbnb houses to total housing stock, and the fee charged by Airbnb to the owners.

Only one year of results was produced, and the results for some countries are still experimental. However, the project showed what is possible using publicly available data.

Figure 5.7. GVA produced by Airbnb hosts as a proportion of accommodation and food services GVA, 2018



Note: Results for the Netherlands only refer to Amsterdam.
Source: (Tobiassen, 2021[84]).

Box 5.3. Developing internationally comparable estimates of GVA produced from Airbnb

The OECD aimed to understand the GVA from accommodation-sharing platforms and its potential impact on the national accounts, with comparable estimates for countries (Tobiassen, 2021[84]). The method, which built on work previously done by Statistics Netherlands (Hiemstra, 2017[109]), estimated the production value and the intermediate consumption that takes place when a room or apartment is rented out on Airbnb (the dominant player in the industry). The difference between the two gives the GVA of Airbnb hosts for one year. An adjustment was made to account for accommodation being facilitated by other platforms.

The production value of Airbnb hosts is composed of total revenues received by Airbnb hosts (which includes a payment for cleaning that is often separately invoiced). These can be estimated using the number of listings and the average revenue per host. For ease, an assumption was made to apply an average cleaning fee for all countries in the analysis. However, if required, a per country estimate could be calculated using the average cleaning costs per booking and overnight stays per year.

Intermediate consumption of Airbnb hosts is composed of small household purchases, cleaning costs, costs of water, heating, electricity, as well as the fee charged by Airbnb to the owners. For the small household purchases and cleaning services per stay, there are no sources available, and it was assumed to be 5 EUR and 55 EUR respectively (for all countries). Based on research, the fee charged by Airbnb to owners was assigned as 3% of rent charged to the guests. Additionally, estimates were made for the fee charged by Airbnb to guests: based on research, this was estimated at 6% to 12% of rent. This amount is considered final household consumption and GVA of the DIP rather than of the hosts.

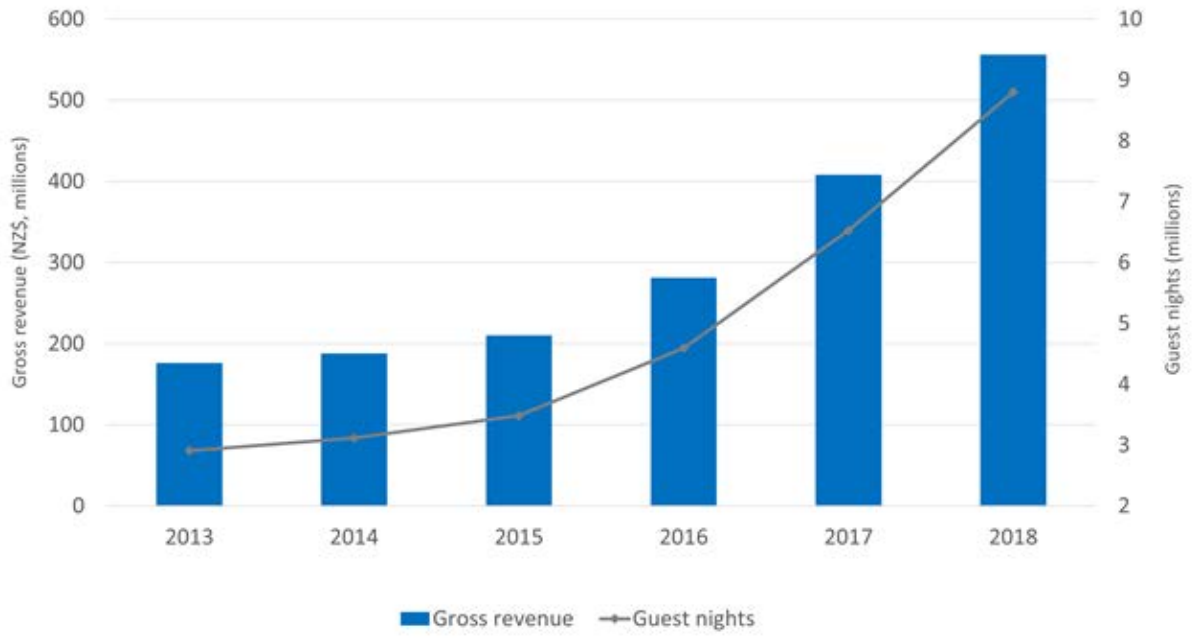
Because Airbnb is based in the United States, the service charge fee charged by Airbnb to the hosts and guests is considered an import of services in other countries. Thus, estimates of imports in respect of accommodation-sharing services can be added to the Digital SUTs.

An adjustment was made for the imputation already included in the national accounts for dwelling services (owner-occupied rent). These estimates of owner-occupied dwelling services assume that owners occupy their homes full-time, such that any unrecorded activity from short-term market lettings, such as Airbnb transactions, will in part be covered by the imputation for owner-occupied rent. Additional output created by making an apartment available through Airbnb can be considered as the difference between the short-term rental price and established rental price used to calculate the imputed owner-occupied rent.

New Zealand has also produced estimates of the level and growth of output generated via accommodation-sharing platforms. Data sourced either from publicly available sites including directly from the platforms was combined with existing data sources such as a regular survey of accommodation occupancy, the national accounts and census information. To create estimates of output, different methods were used for different platforms, depending on the available source data for the platform. In some cases, the total payment received was used as a starting point, before incorporating assumptions regarding the fee charged by the intermediation platform. In others, the known number of accommodation nights was merged with estimates of average prices per night. The results show not only considerable growth of revenue in the five years to 2018 (Figure 5.8), but also that accommodation-sharing revenue accounted for over 10% of total accommodation industry revenue in 2018 (Figure 5.9) (Grant, 2019[110]).

Figure 5.8. Accommodation-sharing guest nights and revenue, New Zealand, year ending March 2013-2018

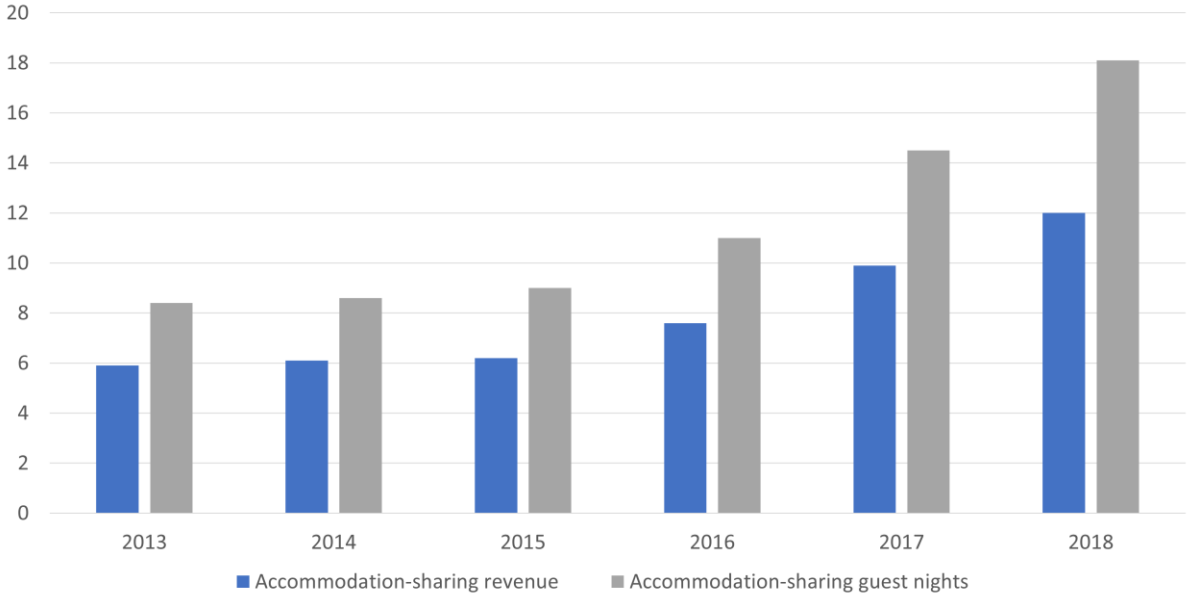
Number of guest nights, million (right-hand-side). Gross revenue, Million New Zealand dollars (left-hand-side).



Source: (Grant, 2019[110]).

Figure 5.9. Size of accommodation-sharing relative to total accommodation industry, New Zealand, year ending March 2013-2018

% of total



Source: (Grant, 2019[110]).

At the time of the research by Grant (2019), estimates of accommodation services from accommodation-sharing platforms were mostly included in the GDP figures of Statistics New Zealand and the conventional SUTs. The excluded portion consists of the difference between the higher average rental income and the imputed rental income for those who own their own house. However due to limited impact this would have on the GDP and SUT estimates combined with the known quality concerns, a decision was made to not use the amount in the core accounts (Grant, 2019[110]). If new estimates produced by research are not included in the conventional SUTs, they cannot be re-allocated to the new digital industries. However, once the quality concerns have been addressed, these estimates could be added to the conventional SUTs and national accounts aggregates and also used for the new digital industry estimates in the Digital SUTs.

Similarly, in other countries where adjustments or additional data may be added to the national accounts aggregates to account more fully for digital transactions, the newly calculated amounts could be moved across, without specifying the units that are being reallocated. Thus, the Digital SUTs, while designed as an extension, could in fact improve the conventional SUTs and estimates of GDP.

Conclusion

This chapter has outlined the definitions and characteristics of the seven new digital industries currently identified in the Digital SUT framework. The compilation of high priority indicators for these new digital industries will depend on their usefulness for policy makers as well as on the ability of countries to produce the indicators.

Countries have so far produced estimates using two different approaches. The first attempts to identify specific units and reallocate the associated estimates to the new digital industries. The alternative approach uses indicators to derive an aggregate estimate of output, intermediate consumption and value added being produced by the new digital industry and reallocates these amounts without identifying the specific units that the estimates relate to. Both approaches have benefits and challenges, and the choice of approach also depends on the type of digital industry for which the estimates are to be compiled.

Even with these two approaches, it appears that countries may still have to make assumptions and adjustments and, at times, be flexible with the digital industry definitions in order to produce estimates. This is to be expected as countries become familiar with the source data and methods during the initial stages of compilation. Different approaches to compiling digital industry estimates are acceptable when accompanied by explanations of what is and is not included, and how the estimates may differ from those produced by other countries.

6 Compiling outputs using templates

The Digital Supply and Use Tables (SUTs) framework includes recommended templates for the outputs. These templates, presented in this chapter, will allow countries to produce outputs in a consistent manner so that they can be compared across countries. Initial outputs consistent with the Digital SUT framework have already been created by several countries and are presented in this chapter.

Introduction

This chapter discusses the presentation of the final outputs by combining the previously obtained digital indicators with the rows and columns of the conventional Supply and Use Tables (SUTs). While these indicators have some value by themselves, as discussed in Chapter 1, it is the process of combining them with the existing national accounts estimates contained in the conventional SUTs that provides the opportunity to put the results in perspective. Bringing them together in a consistent framework also ensures cross-country comparability, which creates important value added for the user.

As discussed in Chapter 2, the initial outputs of the Digital SUTs framework are the high priority indicators. In order for these to be presented in a clear and consistent manner, standardised templates have been created. This chapter presents these templates and discusses their compilation. High priority indicators consistent with the templates have already been produced by a number of countries, and examples are shown throughout the chapter.

In line with the earlier chapters of this handbook, the templates are designed to reflect the transaction, product and industry perspectives. This chapter concludes with some general considerations for countries undertaking this work, based on experiences from countries that have already compiled estimates in line with the framework.

The high priority indicators

Originally, the template for the Digital SUTs consisted of a full SUT altered to include the additional industry columns and product rows (OECD, 2019[111]). To distinguish the mode of transaction, it also included the additional transaction rows for every product within the conventional SUTs. While countries can populate an entire Digital SUT if they wish to, the OECD Informal Advisory Group (IAG) on Measuring GDP in a Digitalised Economy felt that this was too ambitious for most countries. Therefore, it has agreed on a set of collection templates reflecting the high priority indicators. These templates will be the focus of discussion in this chapter.

The high priority indicators and the templates presented in this chapter focus on some of the most important outputs from a user perspective (OECD, 2019[112]). For example, while the transactional rows to distinguish the mode of transaction can theoretically be applied to all products, it is not expected that this will be relevant for all countries. Rather, the creation of a set of agreed upon indicators provides a more obtainable goal for countries to aim for in early stages of development while maximising the international comparability of the framework, which implies focusing on specific rows and columns.

The high priority indicators are:

1. Expenditure split by nature of the transaction.
2. Output and/or Intermediate consumption of Digital Intermediation Services (DIS), Cloud Computing Services (CCS) and total information and Communication Technology (ICT) goods and digital services.
3. Digital industries' output, gross value added (GVA) and its components.

Each of these indicators is explained in more detail in Chapter 2. This part of the handbook focuses on how best to present these outputs in a way that provides the easiest interpretation by users.

Templates for the transaction perspective

Every country that has published estimates consistent with the high priority indicators has published estimates for "total digitally ordered" or "total digitally delivered". So far, these have been provided from the perspective of the supply table, with countries publishing estimates of output based on the nature of the transaction. However, indicators focusing on the nature of the transaction can be presented in relation to both the supply and the use table. Additionally, the template for providing information on the nature of the transaction from the supply table is presented in two different ways, enabling countries to publish in the best way suited for them.

The first set of templates display the nature of the transactions for various aggregates. From the supply side, *transaction template 1A* (Template T1A, Figure 6.1) covers total output, total imports, and total supply broken down by the different ordering options in the rows and the delivery modes in the columns. Template T1A includes the option for presenting nominal values of the estimate.

Transaction template 2 (Template T2, Figure 6.2), displays the nature of the transaction from the use perspective. Template T2 is similar to Template T1A in that the aggregates are broken down by row (for digital ordering) and by column (for digital delivery). In Template T2, the aggregates are for intermediate consumption and final demand, which includes government and household final consumption, gross capital formation and total exports.

The specific indicators suggested as high priority in Chapter 2 included: total household final consumption, total imports, and total exports, which are all covered by these templates. These are presented for total products (Row 1). Originally 10 products[59] were considered as candidates for the transactional breakdown (OECD, 2020[113]), but their inclusion as high priority indicators was considered too ambitious to be included in the initial version of the Digital SUTs framework.

Countries may still produce estimates for specific products split by the nature of the transaction if they wish. This may include products at the classification level usually used in the conventional SUTs, i.e. divisions of the Central Product Classification (CPC) or Classification of Products by Activity (CPA),[60] or at more granular levels. If a country does create transactional estimates for specific products, Row 1 in Templates T1A and T2 should be for the relevant product.

The estimates in Template T1A and Template T2 can also be split by both digital ordering and digital delivery, as well as for the different mechanisms of digital ordering (direct with the counterparty, via platform, etc). Alternatively, it would be possible to report only a split between "digitally ordered" and "not digitally ordered" if there is no additional information on the type of digital ordering.

Figure 6.1 and Figure 6.2 present templates with estimates provided in nominal values. However, these templates (as well as the others shown in this chapter) can also be presented as a proportion (share) of the total taken from the conventional SUTs. These "share of total" templates are shown in Annex 6.A.

[59] The products included: Land transport services and transport services via pipelines; Accommodation services; Food and Beverage serving services; Motion picture, video and television programme production services, sound recording and music publishing; Financial and insurance services; Advertising and market research services; Travel agency, tour operator and other reservation services; Education services; Gambling and betting services; and Publishing services.

[60] The CPA is the European Union's official classification system for products.

Figure 6.1. Template T1A: Transaction perspective – Supply table

Row	Column	A	B	C	D	E	F
	Transaction perspective **Supply Table**	Nominal values					
		Total Output	Of which, digitally delivered	Imports	Of which, digitally delivered	Total Supply	Of which, digitally delivered
1	Total Products						
2	Total Products - Digitally ordered						
3	Direct from a counterparty						
4	Via a digital intermediation platform						
5	Via a resident digital intermediation platform						
6	Via a non-resident digital intermediation platform						
7	Not Digitally ordered						

Figure 6.2. Template T2: Transaction perspective – Use table

Row	Column	A	B	C	D	E	F	G	H	I	J	K	L
	Transaction perspective **Use Table**	Nominal values											
		Intermediate consumption	Of which, digitally delivered	Government Final Consumption	Of which, digitally delivered	Capital Formation	Of which, digitally delivered	Household Final consumption	Of which, digitally delivered	Exports	Of which, digitally delivered	Total Use	Of which, digitally delivered
1	Total Products												
2	Total Products - Digitally ordered												
3	Direct from a counterparty												
4	Via a Digital intermediation platform												
5	Via a resident digital intermediation platform												
6	Via a non-resident digital intermediation platform												
7	Not Digitally ordered												

Box 6.1. The benefit of compiling digital transactions for both the supply and use tables

Totals from both tables assist in calculating missing values as residuals

In line with the fundamental principal of SUTs, supply of total products in Template T1A should match use of total products in Template T2.[61] While it is easy to ensure these are balanced in the Digital SUTs, as they are both taken direct from the conventional SUTs, theoretically each underlying cell within the total supply column, specifying the mode of transaction, should match the equivalent cell in the total use column. For example, production and/or supply that is the result of digital ordering should have an equivalent amount for that type of transaction within the total use column. Importantly, while total supply should equal total use, the latter amount could be made up from any of the columns that make up final demand and intermediate consumption.

This form of "double entry" accounting is very important and is a benefit of compiling both a supply and use table for the nature of the transaction. If business surveys are able to provide estimates of supply via digital transactions, these can then be used as a form of "control" total on the use side. For example, if the total amount of digitally ordered output and imports is known, this amount can be taken from Template T1A and used to populate cell K2 in Template T2. If use information is available on some but not all of the indicators in the use table, the use of estimates from the supply side allows estimates to be derived for missing items based on residuals. For example, if the digital ordering of household consumption, capital formation, intermediate consumption and exports are known and included in Template T2, the part of government consumption that was digitally ordered can be calculated residually. This is one example of possible residual calculation in the framework, but theoretically it can be used to assist in populating any item for which there is limited or no data, provided that the total is known.

An alternative template for the transaction perspective (Template T1B, Figure 6.3) shows the level of output that was digitally transacted with breakdowns by industry**.**

Digitally transacted means output that is either digitally ordered and/or digitally delivered for each industry, with output that is both digitally ordered and digitally delivered only included once so that the cells in the column add to the total shown in Row 1. An alternative would be to show digital ordering and digital delivery in separate rows, but this would be inadvisable because the values might add to more than the total in the conventional SUTs (and recorded in Row 1), as the categories are not mutually exclusive.

Template T1B **(**Figure 6.3**)** is not consistent with the high priority indicators agreed on by the IAG on Measuring GDP in a Digitalised Economy. However, such a presentation may be chosen due to source data considerations. Most national statistical offices (NSOs) receive information on the level of digital ordering via business surveys. Depending on the exact compilation practices for their SUTs, it may be easier to apply this transactional information at the industry level rather than the product level.

[61] These should match as both should be presented in purchaser prices.

Figure 6.3. Template T1B: Transaction perspective – alternative supply table

	Column	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
		Share of total																				
Row	Transction perspective Supply Table	Industry Section A	Industry Section B	Industry Section C	Industry Section D	Industry Section E	Industry Section F	Industry Section G	Industry Section H	Industry Section I	Industry Section J	Industry Section K	Industry Section L	Industry Section M	Industry Section N	Industry Section O	Industry Section P	Industry Section Q	Industry Section R	Industry Section S	Industry Section T	Industry Section U
1	Total Products	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
2	Total Products: Digitally transacted																					
3	Total Products: Not-digitally transacted																					
4	Total Products: Digitally ordered																					
5	Total Products: Not-digitally ordered																					
6	Total Products: Digitaly deliverable																					
7	Total Products: Not-digitally deliverable																					

Four countries have published estimates for digitally ordered and digitally delivered products: Canada, the Netherlands, Ireland and Sweden. These countries have adopted similar but not identical approaches. They have all presented the level of output (from the supply table). Canada and the Netherlands have presented results at an aggregate level (split by domestic output and imports). The Canadian publication used columns to split the estimates based on whether the product was digitally delivered, allowing for all four options to be covered,[62] as recommended in Chapter 3 and in Template T1A (Figure 6.1) above. The resulting matrix is shown in Table 6.1.[63]

Table 6.1. Supply of digitally ordered and delivered products, Canada, 2019

Million Canadian dollars

	Output, digital industries	Output, digital industries, digitally delivered	Total output	Total output, industries, digitally delivered	Total imports	Imports, digitally delivered	Taxes on products	Total supply	Total supply, digitally delivered
Total	204,768	76,461	4,065,386	96,580	722,624	13,236	173,179	4,961,189	115,527
Digitally ordered	73,953	50,362	277,933	65,665	51,723	9,144	6,696	336,352	75,019
Direct from a counterparty	59,612	49,658	218,757	64,961	19,588	8,559	1,072	239,416	73,659
Via a resident DIP	1,193	704	1,193	704	0	0	0	1,193	704
Via a non-resident DIP	3,839	0	3,839	0	984	584	70	4,893	606
Via a resident retailer or wholesaler	9,308	0	54,144	0	31,150	0	5,555	90,849	50
Not digitally ordered	130,815	26,098	3,787,453	30,915	670,902	4,092	166,483	4,624,837	40,508

Note: DIP = digital intermediation platform.
Source: (Statistics Canada, 2021[29]).

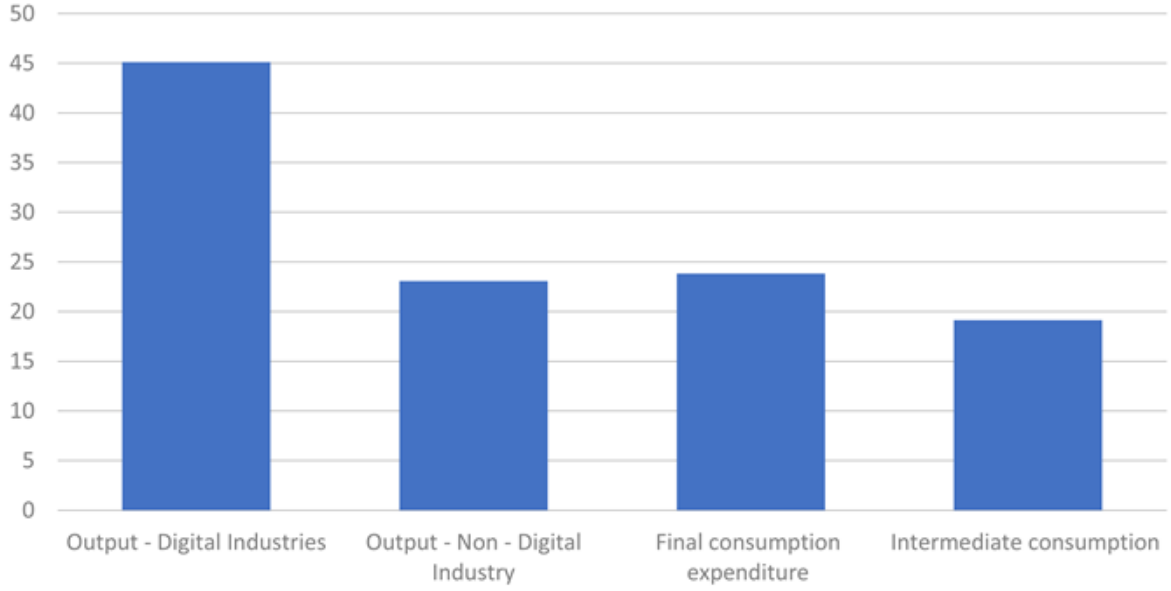
The Netherlands and Sweden have also applied the digitally ordered split to high level aggregates but, unlike Canada, they have applied them to aggregates from both the supply and the use table. From the supply table, the shares of domestic output and of imports that were digitally ordered are separately identified, while from the use table the shares of household consumption, exports and intermediate use that were digitally ordered are published. Estimates for Sweden are shown in Figure 6.4. They do not rely on the matrix suggested in Template T1A (Figure 6.1) Instead, their aggregate estimates are produced by applying digital ordering ratios collected on an industry basis to related products (see **Country experiences of producing Digital SUT outputs**). However, Sweden does not publish an estimate of the share of digitally ordering at the level of products.

[62] Digitally ordered – Digitally delivered / Digitally ordered – non-digitally delivered / non-digitally ordered – digitally delivered / non-digitally ordered – non-digitally delivered.

[63] This table was also shown in Chapter 2 (Table 2.1).

Figure 6.4. Supply and use of products which were digitally ordered, Sweden, 2017

% of total

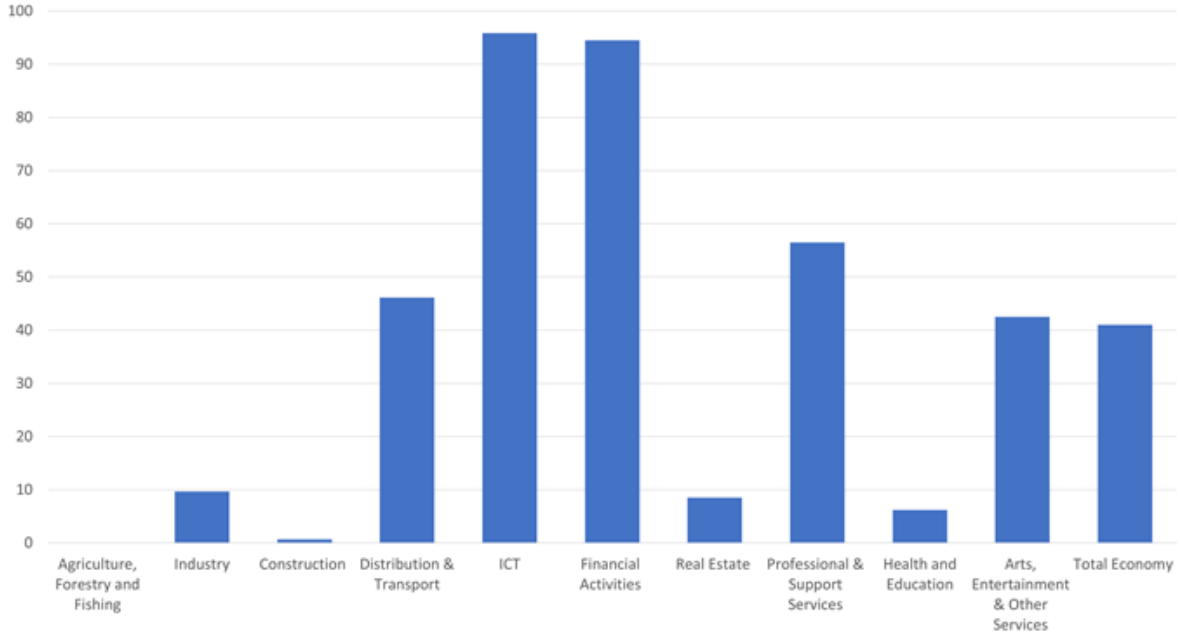


Source: (Statistics Sweden, 2023[83]).

The Central Statistics Office (CSO) Ireland is able to publish estimates relating to the nature of the transaction split by industry. This is consistent with the alternative transactional template (Template T1B, Figure 6.3) presented above. The CSO separated out both “digitally ordered” and “potentially digitally deliverable” as well as combining the two indicators to create the “digitally transacted” indicator, presented on an industry basis (Figure 6.5). While still classifying from a product perspective, based on if the product is digitally deliverable or not (see Chapter 3), the output of these products is assigned to the industry that produces them.

Figure 6.5. Proportion of products transacted digitally, Ireland, 2020

% of total



Source: (CSO Ireland, 2022[33]).

When presenting from the industry perspective, as the CSO Ireland has done, the percentage of digitally delivered products depends on the composition of the services being produced by each industry as well as the level of detail published. This more aggregated level still allows for the long-term trend towards digital delivery to be easily observed.

At an aggregate level, Ireland has also published estimates below that of digitally ordered, providing estimates of output direct with counterparties (websites) and via digital platforms (Table 6.2).

Table 6.2. Proportion of output by nature of transaction, Ireland, 2020

Nature of transaction	%
Digitally ordered	21.8
Digitally ordered direct from counterparty	15.1
Digitally ordered via DIPs	6.7

Source: (CSO Ireland, 2022[33]).

Only the Netherlands and Sweden are technically consistent with the high priority indicators listed in Chapter 2 (by showing expenditure rather than production). However, the results for Canada, the Netherlands, Sweden and Ireland all fit with the templates presented above. The differences relate to the data sources available and used, but the digitally ordered concept is the same for all four countries and thus easily comparable (Table 6.3).

Table 6.3. Proportion of output that is digitally ordered, selected countries

	Canada (%, 2019)	Netherlands (%, 2018)	Sweden (%, 2017)	Ireland (%, 2020)
Digitally ordered	8.3	16.1	25.2	21.8

Source: (Statistics Netherlands, 2021[43]; CSO Ireland, 2022[33]; Statistics Canada, 2021[29]) (Statistics Sweden, 2023[83]).

Templates for the product perspective

The high priority indicators for products within the Digital SUTs can be presented in relation to either the conventional supply table or the conventional use table. From the supply side, *product template 1* (Template P1**,** Figure 6.6) contains the four product rows: the two aggregates, ICT goods and digital services, along with the two separately identified digital products, CCS and DIS. The columns are split between domestic output and imports, thereby making up total supply of the products, and results are shown both in nominal values and as proportions of total products. The industry split of output of specific products is a lower priority: as the digitally enabling industry will make up a significant portion of production of the first three product classes and digital intermediation platforms (DIPs) charging a fee will produce the vast majority of DIS, there is less analytical value to this split when reallocating estimates from the supply side.

The product perspective can also be applied to the use table, in which the industry dimension is of much more interest because the use table details the products that are being consumed in order to produce the final outputs. It is important to know which industries are consuming more ICT goods and digital services as part of their production. *Product template 2* (Template P2, Figure 6.7) from the use table includes intermediate consumption and final demand of the four product rows. The final demand columns include final consumption (by both the household and government sector), gross fixed capital formation (GFCF), and exports. This covers total use of digital products.[64]

[64] Inventories are ignored as they are considered to be very minor for ICT goods and digital services.

Figure 6.6. Template P1: Product perspective – Supply table

	Column	A	B	C	D	E	F
	Product perspective **Supply Table**	Nominal values			Share of total		
Row		Total Output	Imports	Total Supply	Total Output	Imports	Total Supply
1	Total Products				100%	100%	100%
2	Total Digital Products						
3	ICT goods						
4	Digital Services (except CCS and DIS)						
5	Cloud Computing Services (CCS)						
6	Digital Intermediation Services (DIS)						
7	Total Non - Digital Prodcuts						

Figure 6.7. Template P2: Product perspective – Use table

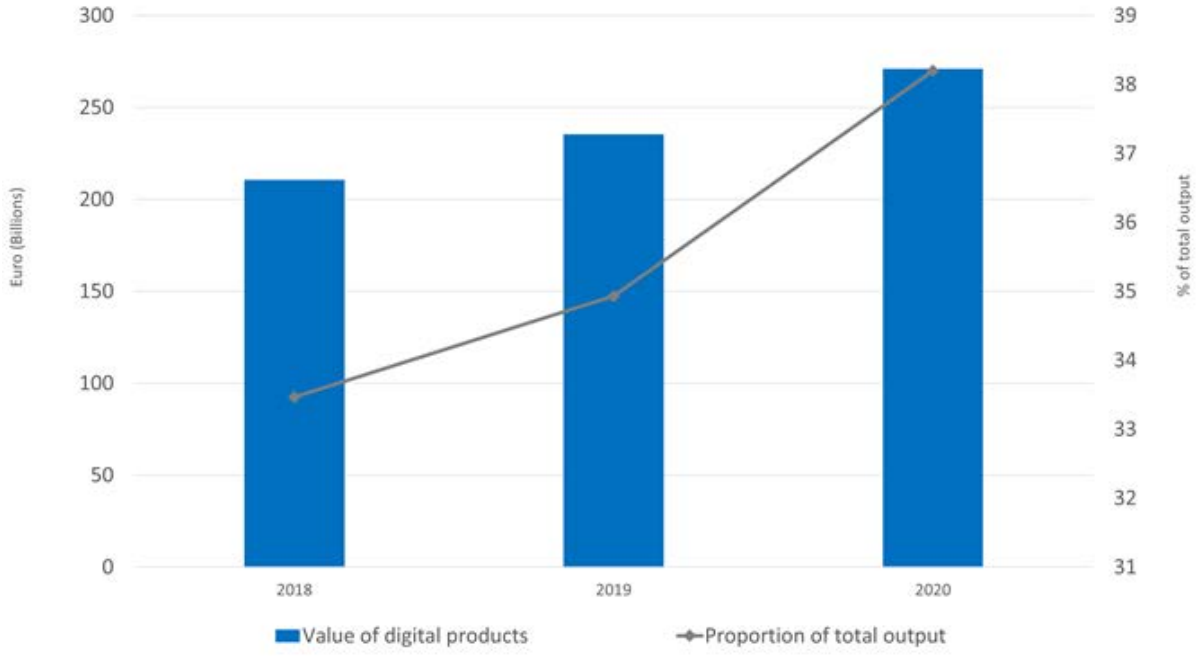
	Column	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA
	Product perspective **Use Table**	Nominal Values																										
		Intermediate Consumption (by industry section)																						Final Demand				
Row		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	All Industries	Government Final Consumption	Capital Fromation	Household Final consumption	Exports	Total Use
1	Total																											
2	Total Digital Prodcuts																											
3	ICT goods																											
4	Digital Services (except CCS and DIS)																											
5	Cloud Computing Services (CCS)																											
6	Digital Intermediation Services (DIS)																											
7	Total Non - Digital Prodcuts																											

The CSO Ireland and Statistics Netherlands have applied the ICT product classification from the CPC Version 2.1, Part 5: Alternative structures (UNSD, 2015[25]) to the product rows in their SUTs, as discussed in Chapter 4. This allowed them to produce an estimate of output associated with digital products. Such a presentation is in line with Template P1.

In looking at the estimates published by the CSO Ireland and Statistics Netherlands we can see a slight difference between the countries, while both publish totals that allow for comparison. The CSO has published an aggregate estimate for all digital products - ICT goods and digital services (Figure 6.8) - consistent with the products listed in Chapter 4. This analysis shows that the nominal value of production of digital products grew by 29% between 2018 and 2020 to €271bn, and made up 38% of overall domestic output in 2020. While the CSO has completed only Row 2 of Template P1, it has provided estimates of both absolute values and proportions.

Figure 6.8. Output of ICT goods and digital services, Ireland, 2018-2020

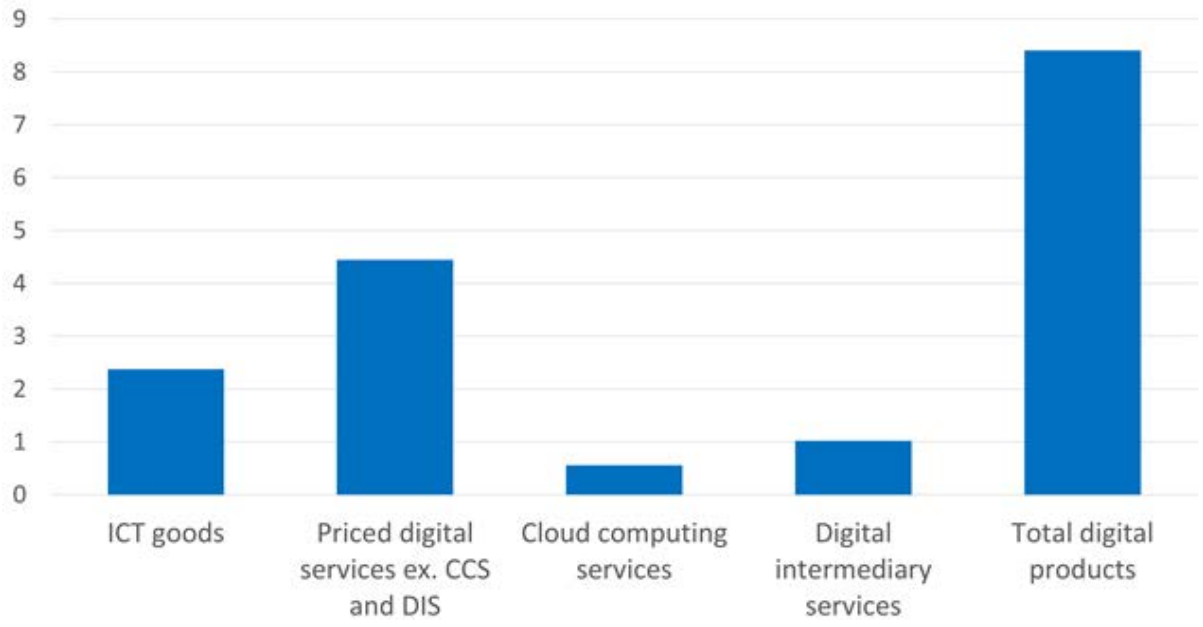
Billion euros (left-hand-side). % of total output (right-hand-side)



Source: (CSO Ireland, 2022[33]).

Statistics Netherlands went a step further by separating out ICT goods from priced digital services, as well as separately estimating the level of output associated with CCS and DIS, the two separately identified products in the framework. The results are shown in Figure 6.9.

Figure 6.9. Digital products, proportion of output, Netherlands, 2018



Source: (Statistics Netherlands, 2021[43]).

Statistics Sweden did the same. Their estimates, presented in Table 6.4, correspond to Rows 2-6 of Template P1, with Row 7 calculated as a residual.

Table 6.4. Digital products, proportion of supply, Sweden, 2017

	% of total supply
ICT goods	1.2
Priced digital services, except CCS and DIS	5.6
Priced CCS	0.8
Priced DIS	0.02
Total digital products	7.6

Source: (Statistics Sweden, 2023[83]).

Ireland, Sweden and the Netherlands have produced estimates consistent with the high priority indicators. The differences between them are a demonstration of the flexibility in the framework, whereby countries produce more granular estimates depending on the data available to them. Importantly, all of these countries can complete Template P1 and their estimates are easily comparable when presented as a proportion of total output.

To produce these estimates, all three countries used more detailed information taken from existing annual economic surveys. For Ireland, these included the Census of Industrial Production, the Annual Services Inquiry, and the Building and Construction Inquiry (CSO Ireland, 2022[33]). The Netherlands used its Structural Business Statistics survey (Statistics Netherlands, 2021[43]). These surveys usually capture information at detailed levels, allowing countries to aggregate output of digital products based on the CPC classification. Similar surveys are undertaken in most countries so aggregates of output split by product are likely to be achievable.

Even if countries do not compile an estimate of digital products consistent with the ICT product classification in CPC Version 2.1 (Part 5: Alternative structures), countries that produce estimates of the separately identified digital products, DIS and CCS would be able to populate these rows in Template P1. For example, the United States Bureau of Economic Analysis (BEA) has produced estimates of the production of CCS for the United States (see Chapter 4). As such, they could complete Row 5 of Template P1 even if the estimates for the total of digital products is not available. In order to facilitate as many international comparisons as possible, countries are encouraged to provide estimates in the template for the information that they have available. As shown in Table 6.5, this allows for comparisons across countries even when gaps for some indicators exist.

Table 6.5. Digital products, proportion of domestic output

	Netherlands (% of output, 2018)	Sweden* (% of output, 2017)	United States (% of output, 2021)	Ireland (% of output, 2020)
ICT goods	2.38	1.20	-	-
Priced Digital Services (excluding CCS and DIS)	4.44	5.60	3.85**	-
CCS	0.56	0.80	0.45	-
Priced DIS	1.02	0.02	-	-
Total digital products	8.41	7.60	8.30	38.20

Notes: * proportion is of total supply rather than domestic output. ** Priced DIS and CCS included in percentage. "-" indicates that information is not available.
Source: (CSO Ireland, 2022[33]) (Statistics Netherlands, 2021[43]; Statistics Sweden, 2023[83]) (Bureau of Economic Analysis, 2022[47]).

The examples of the product perspective that have been discussed so far are from the supply table, that is the production and import of digital products. Template P2 covers an additional product aspect from the use table. It takes the same digital products identified on the supply side and separates them out from the existing product rows on the use table. Such a presentation has the potential to show which industries are increasing their intermediate consumption of digital products, as well as providing insights into the use of digital products in the form of final consumption.

While there have been no publications so far from the use side, examples have been provided by a joint OECD-BEA project (Charara et al., 2021[114]). The Asian Development Bank (ADB)'s work on the digital economy (Asian Development Bank, 2021[115]) also includes examples. The aim of both these pieces of work is to provide evidence of a generally accepted phenomenon that businesses are using more ICT goods and services in response to the increasing level of digitalisation in the economy.

The OECD-BEA project matched the ICT products as classified in the CPC Version 2.1 (Part 5: Alternative structures) and the product classification used within the BEA's SUTs and the OECD SUT database. Box 6.3 outlines the project in more detail. It shows that when estimates are deflated to reflect the declining price of most digital products over the period from 2007 to 2017, most countries observed some increase in the proportion of digital products used in production when compared with all inputs.

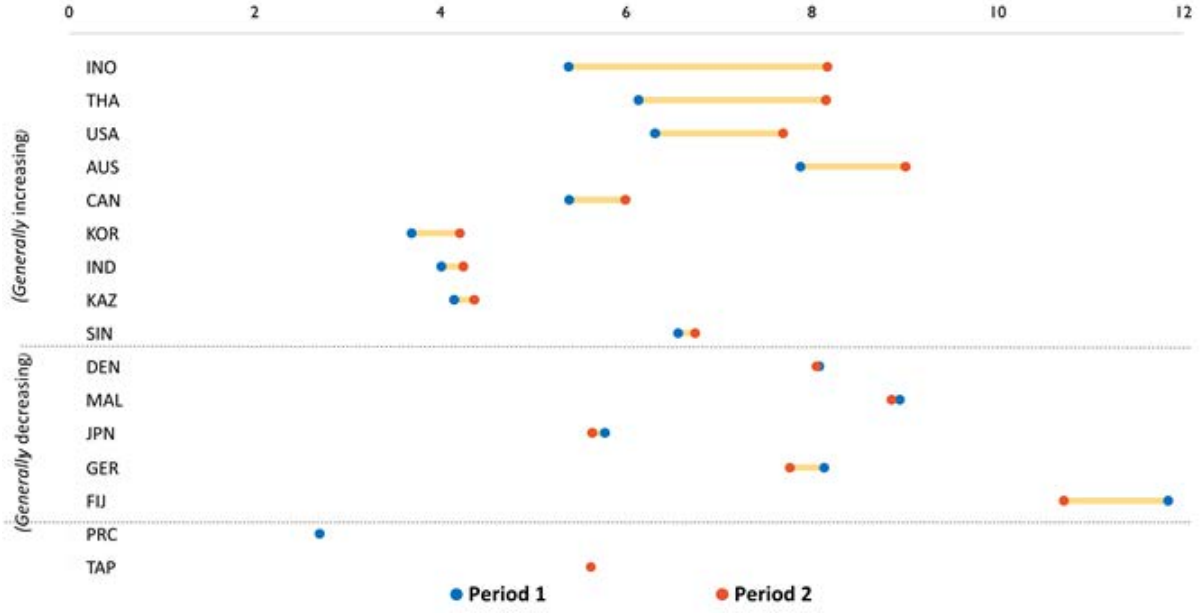
The ADB calculated the share of digital inputs as a proportion of total inputs to production for a number of countries in Asia and elsewhere. They focused on industries that were digitally dependent[65] and compared the ratio over two periods. In a majority of the countries selected for the study, these

[65] The ADB uses forward linkages from the ICT sector to define which industries are digitally dependent. For more information see https://www.adb.org/sites/default/files/publication/722366/capturing-digital-economy-measurement-framework.pdf.

industries increased their share of digital products used in production (Figure 6.10). This kind of analysis could be also done by countries at the industry level in order to calculate which industries within the economy are becoming more digitally intensive.

Figure 6.10. Proportion of digital inputs used in production, selected countries

% of digital inputs in total intermediate inputs



Notes:
AUS = Australia; CAN = Canada; DEN = Denmark; FIJ = Fiji; GER = Germany; IND = India; INO = Indonesia; JPN = Japan; KAZ = Kazakhstan; KOR = Korea; MAL = Malaysia; PRC = China; SIN = Singapore; TAP = Taiwan; THA = Thailand; USA = United States.
Period 1 is AUS, 2010; CAN, 2012; DEN, 2010; FIJ, 2011; GER, 2010; IND, 2010; INO, 2010; JPN, 2011; KAZ, 2001; KOR, 2010; MAL, 2010; SIN, 2000; THA, 2010; USA, 2010.
Period 2 is AUS, 2018; CAN, 2016; DEN, 2016; FIJ, 2015; GER, 2016; IND, 2014; INO, 2014; JPN, 2015; KAZ, 2018; KOR, 2018; MAL, 2015; PRC, 2012; SIN, 2016; TAP, 2016; THA, 2015; USA, 2019.
Source: (Asian Development Bank, 2021[115]).

Box 6.2. The increasing importance of ICT goods and digital services to production

In 2021, the OECD and the BEA undertook a project to produce comparable international estimates that might show the evolving consumption of digital products (Charara et al., 2021[114]). While the Digital SUTs do not show a single numerical estimate of digitalisation's impact on the production process, they can show, over time, the digital/non-digital make up of products used as intermediate consumption and GFCF. As firms embrace digitalisation they will make greater use of digital products both in the assets they are purchasing and in the type of products that they are consuming as inputs into production.

The high priority indicators identified by the IAG on Measuring GDP in a Digitalised Economy were used as a starting point to determine which estimates of digital products would be compiled. While the high priority indicators suggest compiling estimates of consumption of each of the four different rows that make up digital products (ICT goods, priced digital services, DIS and CCS), for the sake of this project, these four rows were combined into a single aggregated product row that includes all ICT products listed in the CPC Version 2.1 (Part 5: Alternative structures).

The ICT products in the CPC classification are listed at the sub-class level which is more disaggregated than the data available in the OECD SUT database. Products in this database are presented at the CPA division level (there are 88 divisions). Therefore, matching was required between the CPC sub-class level and the CPA division level. In some cases, as an entire CPA division could be used, while in others, the share of the CPA division that comprised digital products had to be estimated.

In order to determine the share that the digital products contributed to the CPA divisions, a template was sent to several NSOs. This template asked for the contribution of certain lower-level product items to the more aggregated CPA categories. From these responses, average percentages were calculated that could then be applied to the conventional SUT data at CPA division level. These shares (proportions) are shown in **Table 6.6**.

Table 6.6. Proportions of CPA divisions comprising ICT goods and digital services

CPA Division	% of division comprising digital products
C26 Computer, electronic and optical products	72.7
C33 Repair and installation services of machinery and equipment	3.8
J58 Publishing services	43.6
J61 Telecommunications services	100.0
J62 Computer programming, consultancy and related services	100.0
M71 Architectural and engineering services; technical testing and analysis services	1.9
N77 Rental and leasing services	3.4
S95 Repair services of computers and personal and household goods	49.0

Source: (Charara et al., 2021[114]). Authors' calculation based on responses from NSOs.

The proportions could be applied to products within any column in the SUTs. By adding up the amounts in each cell for a column, estimates could be calculated for a range of indicators such as total final use, household consumption, GFCF and intermediate consumption, at the aggregated level or by industry. If countries undertook this kind of work themselves, the estimates could be improved by using country-specific estimates of the percentage of digital products that make up the CPA division.

Due to the differences between OECD economies, the results were shown as proportions. They showed digital products as shares of the previously mentioned indicators, e.g. digital products consumed as intermediate consumption as a proportion of total intermediate consumption.

The proportions were applied to different SUT years for each country, producing a time series of the proportion of digital products feeding into intermediate consumption at both national and industry levels. However, as they were applied at current prices, any change in the proportion reflected both different compositions of products used and changing prices for digital and non-digital products. A proportion might remain broadly stable, even if the business was increasing the volume of ICT goods and services consumed, if the increase in volume was offset by lower prices of the ICT goods and services.

To overcome this issue, prior to the proportion being calculated, the estimates of the numerator (the current price expenditure on digital products) and the denominator (the current price aggregated indicators from the conventional SUTs, i.e. total use, household consumption, intermediate consumption) were reduced or magnified based on the respective price increase or decrease. The price indices chosen were the Implicit Price Deflator (IPD)[66] for the information and communication industry (representing the digital component) for the numerator and GDP IPD, representing the overall price change experienced in the economy, for the denominator. If countries did this work themselves, they could apply more precise, improving the conversion into volume estimates.

The digital share of intermediate consumption was estimated for eleven countries, on the basis of data taken from the OECD database. The countries' shares were applied for selected countries across Europe, North America, Asia, and Oceania. Table 6.7 shows the change in the digital share of intermediate consumption between 2007 and 2017, while Table 6.8 shows digital shares of GFCF.

Table 6.7. Proportion of ICT goods and digital services used in production

	Intermediate consumption (%)		
Country	2007	2012	2017
Australia		6.8	9.5
Canada		5.7	6.4
Czech Republic	6.6	6.8	6.8
France		4.4	4.3
Germany		3.9	4.5
Italy		2.9	2.7
Korea			8.6
Netherlands		3.8	4.0
Norway		7.3	7.9
United Kingdom	11.0	11.5	12.4
United States	8.5	9.8	12.4

[66] The IPD represents the change in price of a specific aggregate. It is calculated by dividing the estimate on a nominal basis by a volume (or price adjusted) estimate. The ratio created as a result of this calculation represents the change in price.

Table 6.8. Proportion of capitalised ICT goods and digital services

	Gross Fixed Capital Formation (%)		
Country	2007	2012	2017
Australia		7.9	10.9
Canada		8.1	9.8
Czech Republic	9.7	12.0	14.0
France		3.8	4.6
Germany		4.1	4.8
Italy		4.6	5.3
Korea			9.4
Netherlands		4.2	4.9
Norway		5.8	7.3
United Kingdom	16.4	20.0	18.7
United States	20.1	27.5	28.2

Templates for the industry perspective

The indicators from the industry perspective are from the use table. They will involve the reallocation of output, GVA and its components (i.e. compensation of employees, gross operating surplus, and taxes less subsidies on production and imports) from the conventional industries to the newly identified digital industries.

Industry template 1 (Template I1, Figure 6.11) contains each of the digital industries matched with cells where estimates of output, GVA and its components can be recorded either as a nominal value or as a share of the total for the economy.[67] Countries should aim to populate as much of the Template I1 as possible, ideally the components of GVA as well as the output of these industries. There is analytical value to these additional estimates, as information on the production function (ratio of GVA to output) or other analytical ratios (e.g. operating surplus as a percentage of GVA) can be compared with other conventional industries.

The estimates for the specific industries can be calculated from the bottom up or re-allocated in line with the examples shown in Chapter 5. However, when presented in Template I1, the aggregate for all industries (Row 1 in the template) should reconcile with the estimates for total output and total GVA from the conventional SUT.

Annex 6.A contains a numerical example of how to compile Template I1.

[67] Figure 6.10 shows the nominal values. The version of Template I1 showing proportions is included in Annex 1.

Figure 6.11. Digital SUTs Template I1: Industry perspective – Use table

	Column	A	B	C	D	E
	Industry perspective	Nominal values				
Row		Output	Gross Value Added	Compensation of employees	Gross operating Surplus	Taxes less subsidies on production and imports
1	All industries					
2	Non-digital Industries					
3	Digitally enabling industries					
4	DIPs charging a fee					
5	Data and advertising driven digital platforms					
6	Producers dependent on DIPs					
7	E-tailers					
8	Financial service providers predominantly operating digitally					
9	Other producers only operating digitally					

Several countries have published estimates of the high priority indicators from the industry perspective. There is more consistency regarding how these have been presented than for the nature of transaction and product perspectives. The main variation between countries is whether they have published the estimates as either an absolute value or as a percentage of the aggregate amount, both of which are catered for in the design of Template-I1.

Statistics Canada's Digital SUTs publication includes a table consistent with Template I1, although it breaks down the digitally enabling industry into four additional types of activities, based on how they are enabling digitisation (Table 6.9). This was possible because the digitally enabling industries map well with the ICT sector in International Standard Industrial Classification (ISIC) Revision 4. Therefore, certain ISIC classes could be assigned to the new digital categories.

Table 6.9. Gross Value Added of digital industries, Canada, 2017-2019

Million Canadian dollars

	2017	2018	2019
Total, all industries	1,991,534	2,079,869	2,157,352
Total digital industries	103,298	111,384	117,788
Information and communications technology			
Hardware	6,536	7,012	7,243
Software	41,891	45,726	48,013
Telecommunications	36,166	37,175	37,460
Other Services	9,912	10,669	11,511
Digital intermediation platforms	1,728	2,374	3,183
Data- and advertising-driven digital platforms	835	846	979
Online retailers and wholesalers	3,748	4,248	5,187
Digital-only firms providing finance and insurance services	2,340	2,752	3,392
Other producers only operating digitally	448	582	821

Source: (Statistics Canada, 2021[29]).

The compilation methods used by Statistics Canada to generate industry estimates were discussed in Chapter 5. An important caveat is the lack of an independent calculation of GVA based on output and intermediate costs of digital industries. Instead, only the output of firms making up each of the digital industries is used to derive the digital industry estimates of GVA, with cost-to-output ratios of existing industries applied to the identified output. This implies that the production function of the units designated as being in a digital industry is assumed the same as that for their non-digital industry counterparts. Statistics Canada acknowledges that this probably means that there is a "smoothing away [of] very divergent dynamics" (Statistics Canada, 2021[102]). A long-term goal of the Digital SUTs is to have separate information on the cost structure of the digital and non-digital entities.

The Netherlands presents estimates of GVA from digital industries in a similar manner **(**Table 6.10**)**. However, they split e-tailers into e-retailers and e–wholesalers. As was the case for Canada, additional splits are welcome if the data allows for them.

In line with Template I1, Statistics Netherlands has published both the absolute values as well as the shares. They have published both output and GVA, but they have not published the components of GVA due to quality concerns. This is another example of the non-prescriptive nature of the templates, allowing countries to only publish whatever is feasible and relevant.

Table 6.10. Output and Gross Value Added of digital industries, Netherlands, 2018

	Output (million euros)	GVA (million euros)	Share of output (%)	Share of GVA (%)
All industries	1,514.5	692.6	100	100
Total digital industries	137.4	55.3	9	8
Digitally enabling industries	95.4	36.4	69	66
DIPs	16.3	5.4	12	10
Firms dependent on DIPs	1.0	0.7	1	1
E-tailers (retail)	3.4	1.7	2	3
E-tailers (wholesale)	20.7	10.8	15	20
Digital-only firms providing finance and insurance services	0.7	0.4	0	1
Other producers only operating digitally	n/a	n/a		

Source: (Statistics Netherlands, 2021[43]).

Statistics Sweden has also published a table consistent with Template I1 (Table 6.11). The estimates show that the GVA of digital industries in Sweden makes up a slightly larger proportion of total GVA than in the Netherlands.

Table 6.11. Digital industries as a proportion of output and GVA, Sweden, 2017

Digital Industry	% output	% GVA
Digital enabling industries	6.06	5.23
DIPs charging a fee	0.04	0.05
Producers dependent on DIPs	0.06	0.06
E-tailers	2.52	2.88
Financial service providers predominantly operating digitally	--	--
Other producers operating only digitally	1.33	0.88
Total digital industries	10.01	9.10

Source: (Statistics Sweden, 2023[83]).

The consistency of the published estimates for digital industries permits comparison across countries (Table 6.12). The industry dimension has proven to be a desirable and obtainable goal for several countries, including those that have not yet published estimates. This may be because it is aligned with GVA and therefore with GDP, which makes it of particular interest to users. Estimates for total digital ordering or delivery or for digital products are presented as a proportion of total output (from the supply table) or as a proportion of final demand (e.g. household consumption or exports). As such, it is harder to relate the estimates to GDP.

Table 6.12. Digital industry in selected countries as proportion of total GVA

	Sweden (% GVA, 2017)	Netherlands (% GVA, 2018)	Canada (% GVA, 2019)
Digital enabling industries	5.23	5.25	4.83
DIPs charging a fee	0.05	0.8	0.15
Data- and advertising-driven digital platforms	--	--	0.05
Producers dependent on DIPs	0.06	0.1	--
E-tailers	2.88	1.8	0.24
Financial service providers predominantly operating digitally	--	0.06	0.16
Other producers operating only digitally	0.88	--	0.04
Total digital industries	9.10	7.9	5.46

Source: (Statistics Canada, 2021[29]), (Statistics Netherlands, 2021[43]), (Statistics Sweden, 2023[83]).

Country experiences of producing Digital SUT outputs

The final section in this chapter discusses some lessons for countries looking to undertake work to produce outputs based on the Digital SUTs. These are based on examining the experiences of countries that have already compiled estimates in line with the framework.

Canada

Statistics Canada published its initial set of Digital SUTs in 2020. In the publication, which covered the years 2017, 2018 and 2019, estimates of GVA for each of the digital industries as well as output and supply split by the nature of the transaction were published. As with subsequent releases by other countries, the estimates were published as “experimental”, subject to revision as more information became available and methods were further refined (Statistics Canada, 2021[102]).

In presentations that accompanied the release, Statistics Canada noted that the Canadian Digital SUTs were not re-compiled from source data with methods that replicate the production of the standard SUTs. Rather, as advocated throughout this handbook, data in the standard tables is disaggregated based on available indicators, i.e. the approach is one of reallocation rather than re-compilation. Information from source data was used to allocate known elements while the remaining data was completed based on simplifying assumptions and residuals.

Beginning with the supply table, columns were mapped to the digital industries while rows were mapped to the identified digital products. The residual estimates that were not mapped to specific digital rows and columns were considered output of non-digital products by non-digital industries. For the majority of products, the output assigned as digitally ordered at basic prices was proportionally split across all relevant use categories (i.e. intermediate consumption, household final consumption, government consumption, gross fixed capital formation and exports) based on existing proportions, and applied at purchaser prices, ensuring the supply and use remained in balance. In other words, proportions of digital ordering from the supply table were used to break up the use table. This approach not only ensures a balance between digitally ordered total demand and digitally ordered supply but also reflects the higher quality of e-commerce sales measures relative to the limited and weaker quality demand-based source data, especially beyond household surveys.

Some additional assumptions were added to arrive at the total amount of digitally ordered total demand and supply once trade estimates were incorporated. For example, digitally delivered exports were used as an additional source of information for digitally ordered exports derived from domestic output based on the simplifying assumption that digitally delivered products are also digitally ordered.

Digitally delivered exports by product that exceeded the value of digitally ordered exports based on the allocation of digitally ordered output from the supply table were added to the value of digitally ordered exports. These values were subsequently allocated to digitally ordered industry outputs on the supply table on a proportional basis to maintain the product balances. Conversely, digitally ordered imports by product were proportionally allocated to use categories, although for practical reasons some categories, such as inventories, were excluded from the allocation pattern.

This mixture of recorded and modelled data allowed Statistics Canada to produce the high priority indicators not just for a single year but for multiple years. As mentioned by Statistics Canada in their publication, the work also provided an important benchmark for understanding the changes caused by the COVID-19 pandemic in 2020.

The Netherlands

For the Netherlands, the production boundary of the Digital SUTs is consistent with the production boundary of the 2008 SNA (Statistics Netherlands, 2021[43]). Therefore, the standard SUTs are used as the starting point for the Digital SUTs, with economic activities that are already included in the regular SUTs used to fill the new rows (digital products) and columns (digital industries). As such, the task of filling the new rows and columns for digital products and industries meant reallocating estimates already present in the standard SUTs. This process starts with the estimation of the amounts to be shifted from a respective cell in the standard SUT to a digital product and/or industry.

An automation system was programmed in R to conduct this reallocation. The automated data processing system takes several different input files depending on whether the reallocation is focusing on the product and industry or on the nature of the transaction:

- The first input file contains several columns with splits for each row, indicating whether the row pertains to supply or use, the origin industry, the origin product group, the target industry, the target product group, the value to be re-allocated, and an indicator of the quality of the observation.
- The second input file shows whether the row pertains to supply or use, the industry, the product, the fraction digitally ordered, the fraction non-digitally ordered, the fraction ordered through DIPs, the fraction ordered digitally directly from a counterparty, and a quality indicator.
- A final input file is used to separate digitally delivered services with a fraction, representing the number of services digitally deliverable, which is applied to columns.

Matching results for digital industries and products based on data sources with the estimates of the standard SUTs has proven challenging. This is because of corrections to data sources, automatic balancing, and the fact that national accounts prioritise the precision of year-on-year growth rates over the precision of absolute values, leading to some additional balancing in the conventional SUTs. These all contribute to differences between the values in the original data sources and the values in the standard SUTs presented in the national accounts.

It is for this reason that Statistics Netherlands decided to use proportions from the data sources rather than calculating the absolute value of digital firms and products from the data sources. The proportions are applied to the values in the standard SUTs in order to calculate the values to be re-allocated to the new columns and rows. This meant that any discrepancies between the data source and the standard SUTs are re-allocated proportionally allowing for a smoother balancing process.

Sweden

Statistics Sweden produced experimental estimates consistent with the Digital SUT framework in 2023 (Statistics Sweden, 2023[83]). They chose 2017 as a reference year based on the availability of data, both of the conventional SUTs and the source data used to reallocate estimates from the existing rows and columns to the new digital industries and products. This source data included the annual Structural Business Statistics survey, the survey on ICT usage in enterprises, as well as the ICT expenditure survey.

The compilation of the estimates was undertaken using a multi-layered Excel spreadsheet. The initial layer was the conventional SUTs, with each additional layer then introducing reclassifications based on transaction, product and industry indicators. While acknowledging that the flexibility this provides was useful for an initial experimental set of estimates, it is suggested that a more automated process is required if compilation is continued on a more regular basis.

Statistics Sweden made several assumptions in order to compile estimates in areas where source data was not comprehensive. An example is the use of digitally ordering information collected on an industry basis and applied to the corresponding products. Statistics Sweden used the correspondence between the statistical classification of economic activities in the European Community (NACE) and the CPA[68] at the 2-digit level to present the transaction results on a product basis as per Template T1A rather than on an industry basis as in Template 1B.

There was an additional challenge in regard to the transaction data. This information is collected from a survey with a smaller sample size. When this supply side information was combined with the existing lower-level estimates on the use side, some combinations of product and transaction basis were produced that did not make sense. Statistics Sweden decided to keep them in place as they did not want to prioritise detailed estimates (not published) over statistically sound published aggregates. This is an important consideration for countries when striking a balance between compilation methods and dissemination aspirations.

For the compilation of the industry estimates, Statistics Sweden relied on identifying the specific units that should be classified to each new digital industry and then moving the output, intermediate consumption and value added of these units to the new industry. They note that it was challenging to identify units across a range of established ISIC/NACE classifications.

IMF work with countries

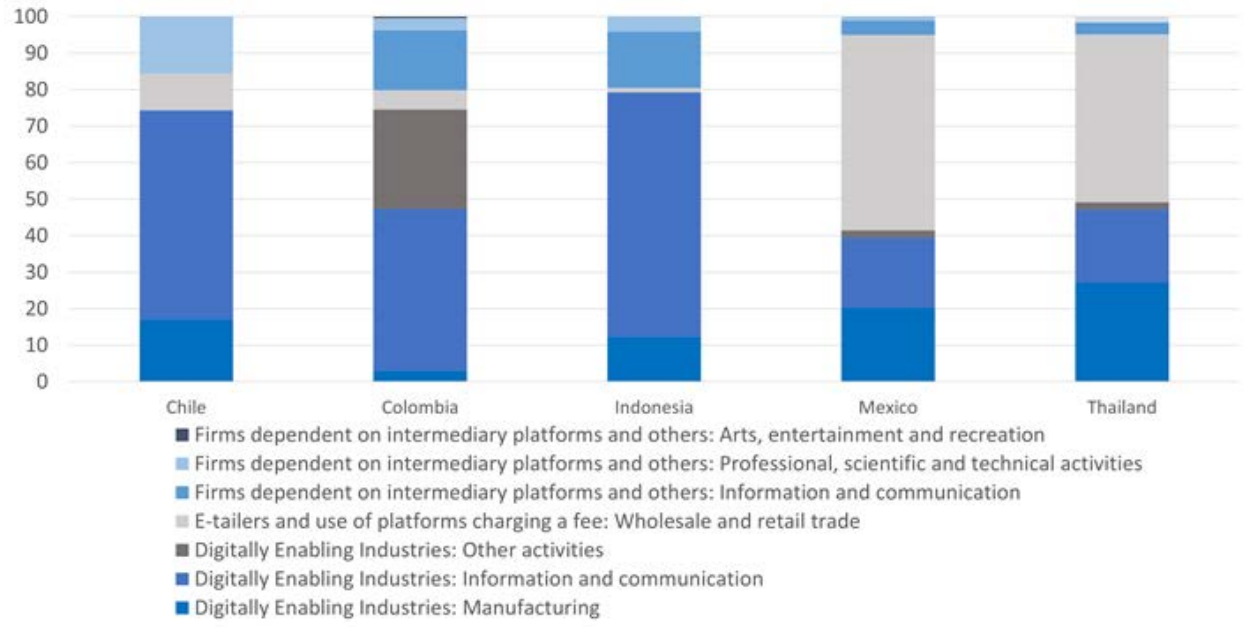
Equally important for the mainstreaming of the framework is the ability for it to be implemented in countries where the statistical infrastructure may not be as advanced. Working with Chile, Colombia, Indonesia, Mexico and Thailand (see Box 6.3), the IMF produced experimental estimates of digital industries based on the concepts and definitions of the Digital SUTs framework, albeit using a different methodology and a sizeable number of assumptions. This allows for relatively straightforward comparisons with other countries that have already released outputs on digital activity.

Figure 6.12 shows the GVA for each of the countries split by the different digital industries. It shows that in a majority of countries the digitally enabling industry (the traditional ICT sector) is by far the largest of the digital industries. In Chile, Colombia, and Indonesia, the digitally enabling industry contributed around three quarters of the overall GVA assigned to the digital industries in 2010-2019, less than the 88% for Canada but higher than the 66% for the Netherlands.

[68] Such a practice is reasonable in this case as NACE at the 2 digit classification level matches the second level CPA classification on a 1:1 basis.

Figure 6.12. Composition of the Digital SUT industries by ISIC sector for participating countries

Average proportion (%) of total GVA of digital industries, 2010-2019



Source: (IMF, 2022[116]).

As noted by the IMF, the differences between the countries were more due to the quality of the source data being used than any definitional differences. This may also occur with conventional indicators in the national accounts. It is expected that progress will continue as more countries produce estimates consistent with the Digital SUTs framework and methodologies are shared across countries.

Box 6.3. Experimental estimates of digital indicators in middle-income countries

Digitalisation is occurring all over the world. Often the statistical infrastructure in middle- and low-income countries provides an additional challenge in trying to visualise digitalisation in the economy. Although the ambitious nature of the Digital SUT framework may mean that it is not appropriate for the full framework to be implemented in every country, certain definitions and concepts can still be applied to improve consistency and offer comparability between countries.

The IMF used the Digital SUTs framework as a starting point when it undertook experimental work with the NSOs of Chile, Colombia, Indonesia, Mexico, and the National Economic Social Development Council (NESDC) of Thailand to quantify how and where the increasing use of digital technologies impacts their economies. The aim was to work towards "a set of digital indicators that provide a unique lens on how digitalization is impacting economic activity" (IMF, 2022[116]).

Since the study aimed at generating estimates of GVA, it focused on the industry perspective. The results showed that digital industries (as defined in the study) existed in all of the participating countries, reflecting the changing nature of retail and the increasing use of DIPs.

Rather than identifying the specific firms that were producing a majority of their output in response to digitally ordering, the IMF study took a "top down" approach, estimating the percentage of output of an industry that was digitally ordered. It then applied this ratio to the estimates of output and GVA, creating digital industries based on aggregate GVA rather than on the output of specific firms transacting digitally. Assumptions were also made in relation to the DIPs, where entire classes of certain industries were included if they were considered similar to DIP even though they may not have been exclusively DIPs.

While the methodology relies on some sizeable assumptions, the study is useful for comparing certain industries where the methodology is similar, such as the digital enabling industries and e-tailers. Results for other digital industries can also be provisionally compared with outputs based on the Digital SUT framework, as long as they are accompanied by clear explanations of the methodologies and definitions used. This may provide a starting point while a country's NSO gathers more source data and creates estimates that are consistent with those of the Digital SUTs.

Conclusion

This chapter has provided more detail on the templates that countries can complete to produce outputs aligned with the Digital SUT framework. It has shown that of the countries that have published outputs already, no two are alike. However, this does not mean the results are not comparable. Rather, additional outputs are often created if data is available or if the NSO believes them to be of particular policy interest. This non-prescriptive nature of the framework, where countries can publish all the data available to them (and not publish results for which they lack data or have quality concerns), helps countries to make progress and publish results, even if they are "experimental".

One solution that several countries have adopted is applying proportions to the conventional SUTs. This is possible because the conventional SUTs include all the information that the Digital SUTs aim to present, although it is not shown separately. Indicators can be used to produce proportions that are applied to the rows and columns of the conventional SUTs. In this case, the compilation of the Digital SUTs concerns a reallocation rather than a calculation from scratch. This approach not only allows for easier updates in future but can save work in the current compilation by removing the need to rebalance. Such a process is often used with balancing conventional SUTs.

Producing estimates consistent with the framework is often a work-in-progress, with additional outputs published each year as the organisation works through the methodology and new data sources become available. Countries that have already undertaken this work acknowledge that the hardest part of the project is to produce a first set of estimates. Subsequent results are easier to compile. For example, Statistics Netherlands has recently finished the project of adding a subsequent year of data while Statistics Canada is planning to produce another year of Digital SUT outputs using previously compiled indicators when an additional year of conventional SUT data becomes available. Alternatively, countries can update Digital SUT outputs if revised estimates of information used to reallocate the conventional SUTs become available.

Annex 6.A. All templates

Annex Figure 6.A.1. Digital SUT Template T1A: Transaction perspective – supply table: nominal values

Row	Column	A	B	C	D	E	F
	Transaction perspective **Supply Table**	Nominal values					
		Total Output	Of which, digitally delivered	Imports	Of which, digitally delivered	Total Supply	Of which, digitally delivered
1	Total Products						
2	Total Products - Digitally ordered						
3	Direct from a counterparty						
4	Via a digital intermediation platform						
5	Via a resident digital intermediation platform						
6	Via a non-resident digital intermediation platform						
7	Not Digitally ordered						

Annex Figure 6.A.2. Digital SUT Template T1A: Transaction perspective – supply table: share of total

Row	Column	A	B	C	D	E	F
	Transaction perspective **Supply Table**	Share of Total					
		Total Output	Of which, digitally delivered	Imports	Of which, digitally delivered	Total Supply	Of which, digitally delivered
1	Total Products	100%		100%		100%	
2	Total Products - Digitally ordered						
3	Direct from a counterparty						
4	Via a Digital intermediation platform						
5	Via a resident digital intermediation platform						
6	Via a non-resident digital intermediation platform						
7	Not Digitally ordered						

Note: Columns B, D and F are presented as a proportion of the share recorded in columns A, C and E.

Annex Figure 6.A.3. Digital SUT Template T2: Transaction perspective – use table: nominal values

	Column	A	B	C	D	E	F	G	H	I	J	K	L
	Transaction perspective Use Table	Nominal values											
Row		Intermediate consumption	Of which, digitally delivered	Government Final Consumption	Of which, digitally delivered	Capital Formation	Of which, digitally delivered	Household Final consumption	Of which, digitally delivered	Exports	Of which, digitally delivered	Total Use	Of which, digitally delivered
1	Total Products												
2	Total Products - Digitally ordered												
3	Direct from a counterparty												
4	Via a Digital intermediation platform												
5	Via a resident digital intermediation platform												
6	Via a non-resident digital intermediation platform												
7	Not Digitally ordered												

Annex Figure 6.A.4. Digital SUT Template T2: Transaction perspective – use table: share of total

	Column	A	B	C	D	E	F	G	H	I	J	K	L
	Transaction perspective Use Table	Share of totals											
Row		Intermediate consumption	Of which, digitally delivered	Government Final Consumption	Of which, digitally delivered	Capital Formation	Of which, digitally delivered	Household Final consumption	Of which, digitally delivered	Exports	Of which, digitally delivered	Total Use	Of which, digitally delivered
1	Total Products	100%		100%		100%		100%		100%		100%	
2	Total Products - Digitally ordered												
3	Direct from a counterparty												
4	Via a Digital intermediation platform												
5	Via a resident digital intermediation platform												
6	Via a non-resident digital intermediation												
7	Not Digitally ordered												

Note: Columns B, D, F, H, J and K are presented as a proportion of the share recorded in the previous column.

Annex Figure 6.A.5. Digital SUT Template T1B: Transaction perspective – alternative supply table: nominal values

	Column	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
	Transction perspective **Supply Table**	Nominal values																				
Row		Industry Section A	Industry Section B	Industry Section C	Industry Section D	Industry Section E	Industry Section F	Industry Section G	Industry Section H	Industry Section I	Industry Section J	Industry Section K	Industry Section L	Industry Section M	Industry Section N	Industry Section O	Industry Section P	Industry Section Q	Industry Section R	Industry Section S	Industry Section T	Industry Section U
1	Total Products																					
2	Total Products: Digitally ordered																					
3	Total Products: Not-digitally ordered																					

Note: Sections A to U referred to in the column headings reflect ISIC classifications, but can be replaced with the industry classification used for conventional SUTs.

Annex Figure 6.A.6. Digital SUT Template T1B: Transaction perspective – alternative supply table: share of total

	Column	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
	Transction perspective **Supply Table**	Share of total																				
Row		Industry Section A	Industry Section B	Industry Section C	Industry Section D	Industry Section E	Industry Section F	Industry Section G	Industry Section H	Industry Section I	Industry Section J	Industry Section K	Industry Section L	Industry Section M	Industry Section N	Industry Section O	Industry Section P	Industry Section Q	Industry Section R	Industry Section S	Industry Section T	Industry Section U
1	Total Products	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
2	Total Products: Digitally ordered																					
3	Total Products: Not-digitally ordered																					

Note: Sections A to U referred to in the column headings reflect ISIC classifications, but can be replaced with the industry classification used for conventional SUTs.

Annex Figure 6.A.7. Digital SUT Template P1: Product perspective – supply table: nominal values

	Column	A	B	C
	Product perspective **Supply Table**	Nominal values		
Row		Total Output	Imports	Total Supply
1	Total Products			
2	Total Digital Products			
3	ICT goods			
4	Digital Services (except CCS and DIS)			
5	Cloud Computing Services (CCS)			
6	Digital Intermediation Services (DIS)			
7	Total Non - Digital Prodcuts			

Annex Figure 6.A.8. Digital SUT Template P1: Product perspective – supply table: share of total

	Column	A	B	C
	Product perspective **Supply Table**	Share of total		
Row		Total Output	Imports	Total Supply
1	Total Products	100%	100%	100%
2	Total Digital Products			
3	ICT goods			
4	Digital Services (except CCS and DIS)			
5	Cloud Computing Services (CCS)			
6	Digital Intermediation Services (DIS)			
7	Total Non - Digital Prodcuts			

Annex Figure 6.A.9. Digital SUT Template P2: Product perspective – use table: Nominal values

Row	Column	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA
	Product perspective Use Table	Nominal Values																										
		Intermediate Consumption																						Final Demand				
		Industry Section A	Industry Section B	Industry Section C	Industry Section D	Industry Section E	Industry Section F	Industry Section G	Industry Section H	Industry Section I	Industry Section J	Industry Section K	Industry Section L	Industry Section M	Industry Section N	Industry Section O	Industry Section P	Industry Section Q	Industry Section R	Industry Section S	Industry Section T	Industry Section U	All Industries	Government Final Consumption	Capital Formation	Household Final consumption	Exports	Total Use
1	Total																											
2	Total Digital Products																											
3	ICT goods																											
4	Digital Services (except CCS and DIS)																											
5	Cloud Computing Services (CCS)																											
6	Digital Intermediation Services (DIS)																											
7	Total Non - Digital Products																											

Note: Please note that the sections A to U referred to in the column headings reflect ISIC classifications but can be replaced with the industry classification used in ones compilation of conventional SUTs.

Annex Figure 6.A.10. Digital SUT Template P2: Product perspective – use table: share of total

Row	Column	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA
	Product perspective Use Table	Share of total																										
		Intermediate Consumption																						Final Demand				
		Industry Section A	Industry Section B	Industry Section C	Industry Section D	Industry Section E	Industry Section F	Industry Section G	Industry Section H	Industry Section I	Industry Section J	Industry Section K	Industry Section L	Industry Section M	Industry Section N	Industry Section O	Industry Section P	Industry Section Q	Industry Section R	Industry Section S	Industry Section T	Industry Section U	All Industries	Government Final Consumption	Capital Formation	Household Final consumption	Exports	Total Use
1	Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
2	Total Digital Products																											
3	ICT goods																											
4	Digital Services (except CCS and DIS)																											
5	Cloud Computing Services (CCS)																											
6	Digital Intermediation Services (DIS)																											
7	Total Non - Digital Products																											

Note: Please note that the sections A to U referred to in the column headings reflect ISIC classifications but can be replaced with the industry classification used for conventional SUTs.

Annex Figure 6.A.11. Digital SUT Template I1: Industry perspective – use table: nominal values

	Column	A	B	C	D	E
	Industry perspective	Nominal values				
Row		Output	Gross Value Added	Compensation of employees	Gross operating Surplus	Taxes less subsidies on production and imports
1	All industries					
2	Non- Digital Industries					
3	Digitally enabling industry					
4	DIPs charging a fee					
5	Data and advertising driven digital platforms					
6	Producers dependent on intermediation platforms					
7	E-tailers					
8	Financial service providers predominantly operating digitally					
9	Other producers only operating digitally					

Annex Figure 6.A.12. Digital SUT Template I1: Industry perspective – use table: share of total

	Column	A	B	C	D	E
	Industry perspective	Share of Total				
Row		Output	Gross Value Added	Compensation of employees	Gross operating Surplus	Taxes less subsidies on production and imports
1	All industries	100%	100%	100%	100%	100%
2	Non- Digital Industries					
3	Digitally enabling industry					
4	DIPs charging a fee					
5	Data and advertising driven digital platforms					
6	Producers dependent on intermediation platforms					
7	E-tailers					
8	Financial service providers predominantly operating digitally					
9	Other producers only operating digitally					

Annex 6.B. Numerical example of compilation of industry estimates

This annex provides an example of how to compile the high priority indicators from the industry perspective using Template I1. The first step is to transfer estimates of output, GVA, compensation of employees, gross mixed income and operating surplus, and taxes less subsidies on production and imports from the use table of the conventional SUTs (Annex Figure 6.B.1**).**

Annex Figure 6.B.1. Digital SUT template: Template I1 – Step 1

	Column	A	B	C	D	E
	Industry perspective	Nominal values				
Row		Output	Gross Value Added	Compensation of employees	Gross operating Surplus	Taxes less subsidies on production and imports
1	All industries	200	150	80	60	10
2	Non-digital Industries					
3	Digitally enabling industries					
4	DIPs charging a fee					
5	Data and advertising driven digital platforms					
6	Firms dependent on intermediation platforms					
7	E-tailers					
8	Financial service providers predominantly operating digitally					
9	Other producers only operating digitally					

In this example, estimates for the digital industries come in three groups, with all the estimates derived by identifying the specific units that meet the characteristics of the digital industry. Estimates are then calculated based on these identified units.

This first group is the digitally enabling industry. As this industry is outlined within the standard industry classifications, the classes, groups and divisions can be separated from the conventional industries and estimates for the five columns can be estimated (Step 2). The example is shown in Annex Figure 6.B.2.

Annex Figure 6.B.2. Digital SUT template: Template I1 – Step 2

	Column	A	B	C	D	E
	Industry perspective	Nominal values				
Row		Output	Gross Value Added	Compensation of employees	Gross operating Surplus	Taxes less subsidies on production and imports
1	All industries	200	150	80	60	10
2	Non-digital Industries					
3	Digitally enabling industries	48	32	14	16	2
4	DIPs charging a fee					
5	Data and advertising driven digital platforms					
6	Firms dependent on intermediation platforms					
7	E-tailers					
8	Financial service providers predominantly operating digitally					
9	Other producers only operating digitally					

The next group of estimates is based on the e-commerce survey in the country. Such a method was used by Ireland, the Netherlands and Sweden who were able to use this survey to identify those businesses that

were getting more than 50% of their sales value from either the company's website, an Electronic Data Interchange, or DIP.

Based on this survey, businesses that are classified to the retail and wholesale industry division but also receive more than 50% of their orders online are identified as e-tailers. Producers that receive more than 50% of their orders from DIPs are identified as producers dependent on DIPs. These could come from any industry classification except retail or finance, as such firms would be placed in either e-tailers or financial service providers predominantly operating digitally. Finally, the survey is used to identify any producers that are exclusively receiving digital orders (excluding those already classified to e-tailers or firms dependent on DIPs). These units are identified as other producers only operating digitally.

Once units for all three digital industries are classified, estimates from the survey forms can be used to compile the estimates for the five columns in the same manner as the digital enabling industries. In some cases, the information from the e-commerce survey may not be as exhaustive as that from the more comprehensive annual business survey. In these situations, an indicator from the e-commerce survey can be used to split up estimates from existing estimates available. For example, if the e-commerce survey indicates that sales from units that only operate digitally make up 2% of all sales (both digital and non-digital), this ratio may be used to derive estimates for this industry. This third step is undertaken in Annex Figure 6.B.3.

Annex Figure 6.B.3. Digital SUT template: Template I1 – Step 3

	Column	A	B	C	D	E
		Nominal values				
Row	Industry perspective	Output	Gross Value Added	Compensation of employees	Gross operating Surplus	Taxes less subsidies on production and imports
1	All industries	200	150	80	60	10
2	Non - Digital Industries					
3	Digitally enabling industries	48	32	14	16	2
4	DIPs charging a fee					
5	Data and advertising driven digital platforms					
6	Firms dependent on intermediation platforms	7	5	3	1	1
7	E-tailers	12	8	4	3	1
8	Financial service providers predominantly operating digitally					
9	Other producers only operating digitally	4	3	1.6	1.2	.2

The final group of estimates covers DIPs charging a fee, data and advertising driven digital platforms and financial service providers predominantly operating digitally. These estimates are derived via either a manual or systematic process that identifies the potential units that meet the characteristics of these digital industries. Examples from the United Kingdom, the Netherlands and Canada have been mentioned in the handbook (Chapter 5).

Once the units are identified, compilers can calculate the specific outputs for the five columns (Step 4). If no information is currently available, the annual business survey may need to be modified to collect it, for example by ensuring that the units in these digital industries are covered by the survey. It may become clear that there are no resident units that meet the characteristics of a specific industry. In this example, we illustrate this for data and advertising driven platforms: the industry is left blank in Annex Figure 6.B.4, while estimates are included for the other digital industries.

The fifth and final step is to calculate the non-digital industries residually by taking away each of the digital industries' amounts from the total taken from the conventional SUTs. This final step is done in Annex Figure 6.B.5.

Annex Figure 6.B.4. Digital SUT template: Template I1 – Step 4

	Column	A	B	C	D	E
	Industry perspective	Nominal values				
Row		Output	Gross Value Added	Compensation of employees	Gross operating Surplus	Taxes less subsidies on production and imports
1	All industries	2000	1500	800	600	100
2	Non-digital Industries					
3	Digitally enabling industries	480	320	140	160	20
4	DIPs charging a fee	25	15	8	6	1
5	Data and advertising driven digital platforms	-	-	-	-	-
6	Firms dependent on intermediation platforms	7	5	3	1	1
7	E-tailers	12	8	4	3	1
8	Financial service providers predominantly operating digitally	45	33	14	16	3
9	Other producers only operating digitally	40	30	16	12	2

Annex Figure 6.B.5. Digital SUT template: Template I1 – Step 5

	Column	A	B	C	D	E
	Industry perspective	Nominal values				
Row		Output	Gross Value Added	Compensation of employees	Gross operating Surplus	Taxes less subsidies on production and imports
1	All industries	2000	1500	800	600	100
2	Non-digital Industries	1391	1165	615	478	72
3	Digitally enabling industries	480	320	140	160	20
4	DIPs charging a fee	25	15	8	6	1
5	Data and advertising driven digital platforms	-	-	-	-	-
6	Firms dependent on intermediation platforms	7	5	3	1	1
7	E-tailers	12	8	4	3	1
8	Financial service providers predominantly operating digitally	45	33	14	16	3
9	Other producers only operating digitally	40	30	16	12	2

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OECD Handbook on Compiling Digital Supply and Use Tables

The digital economy is growing, with producers increasingly using digital technology to revolutionise their production processes, and with new business models being created based on the digital transformation. To improve the visibility of digitalisation in macroeconomic statistics, the Digital Supply and Use Tables (SUTs) framework has been developed under the auspices of the OECD's Informal Advisory Group (IAG) on Measuring GDP in a Digitalised Economy. In the Digital SUTs framework, three dimensions are introduced for measuring the digital economy: the nature of the transaction (the "how"), the goods and services produced (the "what"), and the new digital industries (the "who"). The OECD Handbook on Compiling Digital SUTs explains these three dimensions and includes examples. It also presents the high priority indicators that have been agreed by the IAG and includes recommended templates for producing the outputs.

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