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Applying Digital Supply-Use Tables in Developing Economies

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Summary

Digitally focused indicators are absent within the System of National Accounts, the standard statistical framework for measuring economic activity. The Digital Supply–Use Tables (Digital SUTs) framework was created to improve the visibility of and information available on digital phenomena while being consistent with the existing national account statistics. The framework has been designed as a derivation from the Supply-Use Tables (SUTs). However, SUTs are not available in many developing countries and often come infrequently with significant time lags. This technical note looks at how countries with SUTs can take steps to begin applying the Digital SUTs framework, and how the fundamental principles and approaches set out in the Digital SUTs framework can be applied to key national accounts aggregates that are more widely available in developing countries, without requiring full SUTs. It points to actions that countries with a limited statistical basis to work from can take to begin compiling Digital SUTs or key indicators following the principles of the framework.

1. Introduction

Digitalization has fundamentally altered the production and consumption of goods and services worldwide. Firms are disrupting established markets and improving the efficiency of their production processes through digitalization, automating tasks previously done by humans as well as using digital tools to communicate and carry out professional work. 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. This phenomenon is becoming near universal due to the continual growth of internet use in all countries with two thirds of the world's population now using the internet (ITU, 2022).

Despite extensive digitalization across economies, digitally focused indicators are absent within the System of National Accounts, the standard statistical framework for measuring economic activity. The Digital Supply–Use Tables framework was created to improve the visibility of and information available on digital phenomena while being consistent with the existing national account statistics.

The compilation of Digital SUTs does not make existing efforts to measure e-commerce, the ICT sector, or ICT products redundant; on the contrary the framework is enabled by these initiatives. However, while there are many examples of countries gathering information on e-commerce, the variability of methods and sources, limits both their exhaustiveness and comparability (UNCTAD, 2023). Taking this information and using it, not just as stand-alone output, but as a basis to derive complementary break downs for national accounts measures that have been compiled in a way that is exhaustive and comparable, such as those in SUTs, can help to alleviate this problem. Furthermore, the Digital SUTs framework goes beyond e-commerce and ICTs, as it includes the digital products being produced as well as actors that are reliant on digitalization to generate their contribution to the economy.

The Digital SUTs framework was originally developed by the OECD (2019) and includes outputs that can be compiled in diverse ways. It primarily provides a framework for the reallocation of SUT tables, in countries with those available.

At the same time, the framework offers flexibility for all countries looking at increasing the visibility of digitalization in their economy. Rather than absolutely requiring full SUTs, many of the concepts and indicators outlined in the Digital SUTs framework can be applied to aggregates that are often compiled as part of standard annual national accounts[1]. These aggregates include total output and value added either covering the entire economy or split by industry, total household final consumption, total imports & exports. The production of indicators that provide greater intelligence on digitalization's impact on the economy is a priority for policy makers and cannot always wait until SUTs are fully developed. Therefore, while the Digital SUTs framework is aimed at breaking down rows and column of SUTs, the concepts within the framework can still provide value to users if applied to alternative national account outputs.

This technical note presents a summary of the Digital SUTs framework, including the policy areas where information from the Digital SUTs can be of most use. It will then identify specific areas of the framework that are most obtainable for countries with a more limited base at their disposal and include some examples of work that countries are already doing in this area.

2. Overview of the Digital SUTs

Digital Supply-Use tables are generated by adding additional rows and columns to the existing SUTs. When designing a framework to increase the visibility of digitalization in the national accounts, it was considered more practical for countries to create new estimates by breaking down existing national account outputs rather than building up new outputs (OECD, 2023). By beginning with SUTs, three different, but interlinked, measurement perspectives can be utilized. These three measurement approaches (transactional, product, and industry) are discussed in more detail below. While the framework is based on the full SUTs outlined in the System of National Accounts (UNSD, 2009), many of the high priority indicators within the framework can be created by breaking down core National Account aggregates such as Household final consumption expenditure, intermediate consumption, imports and exports - rather than relying on the detailed product rows and industry columns that exist in the SUTs.

It is worth noting up front that the Digital SUTs framework does not define or seek to measure "the digital economy" or list a specific set of activities as making up the digital economy. Since digitalization impacts the creation and delivery of almost every good or service within the economy in one way or another, it was seen as futile to try and delineate certain industries or products as "digital" while delineating others as "non-digital". In this way the OECD's view was shared by the IMF as early as 2018, when it suggested that "the Digital Economy could well equal the entire economy if defined in the broadest sense" (IMF, 2018). This is not to disregard the usefulness of an internationally agreed upon definition, but rather, due to the range of opinions on what should be included (and excluded) in such a definition, the framework aims to achieve consensus on definitions of

[1] Since the SUTs is a comprehensive representation of the economy, many of these aggregates do appear within the SUTs, but they are often compiled by countries regardless of whether they subsequently produce SUTs or not.

components, rather than of the digital economy itself. As will be discussed later in this technical note, the replacement of a single all-encompassing "digital economy" estimate with multiple indicators on specific digital phenomena provides a level of information often much more useful to policy makers, since it allows greater clarity on the specific digital elements driving growth.

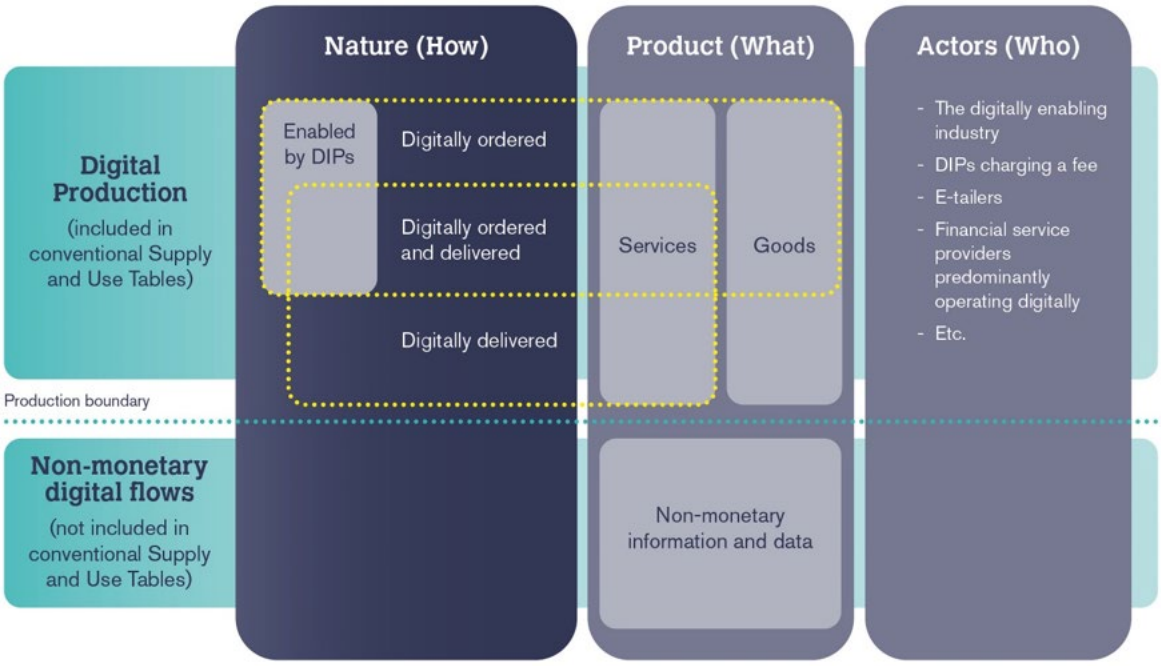
The suite of indicators generated informs users on specific trends, products and actors that are considered as quintessential of the digital economy. Importantly, it provides insight in how specific elements of the digital economy are represented and accounted for within the existing national account aggregates.

The framework contains three distinct dimensions, which 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 ('who').

The three perspectives (see figure 1) reflect the multidimensional nature of the digital economy, beyond a simple aggregation of digital products. Furthermore, the framework offers the possibility of creating a range of different outputs depending on the data available to the country.

Figure 1. The conceptual framework of Digital SUTs



Source: (OECD, 2023) adapted from (IMF, OECD, UNCTAD and WTO, 2023).
Note: 1. DIPs = Digital Intermediation Platforms.
2. There are currently seven new digital industries; the last column in Figure 1 shows examples.

3. The three perspectives of the Digital SUTs

A summary of the three perspectives is included below, much of this material is taken from several publications focused on the Digital SUTs framework, most of which were produced by the OECD's Informal Advisory Group

on Measuring GDP in a Digitalized Economy (IAG) and the ISWGNA Digitalization task team[2]. These publications outline in detail the Digital SUTs framework, including specific definitions and compilation examples[3].

a. Nature of the transaction

The nature of transaction is the fundamental differentiator of the Digital SUTs, as conventional SUTs or national account outputs make no distinction on how a transaction is facilitated. In the modern economy, goods and services which were previously dominated by physical transactions are increasingly being ordered digitally including via third party apps, a trend that picked up speed during the pandemic[4].

Within the Digital SUTs framework, a product can either be digitally ordered, or non-digitally ordered - with digital ordering 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".

Likewise, a service can be digitally delivered or non-digitally delivered -with the former defined as "transactions that are delivered remotely over computer networks"[5].

Both definitions are consistent with those put forward in the recent update in the Handbook on Measuring Digital Trade (IMF, OECD, UNCTAD and WTO, 2023). Also like the digital trade framework is the additional delineation between how the product is digitally ordered, either direct with producer or via a third-party digital intermediation platform (see digital industries).

The addition of the transaction dimension reflects the importance of digital ordering and digital delivery in the modern economy. While the distinction between digital and non-digital ordering can be applied to every product within the SUTs due to the sometimes limited availability of source data on digital ordering, it is considered more feasible to apply this at a relatively aggregated level, such as total exports or the published household final consumption expenditure categories.6 Conversely, since it is applied to SUT columns not rows, the digitally deliverable split is only applied to aggregate estimates, such as total output, final consumption, imports and exports (See Columns 'T' in figure 2).

[2] The ISWGNA is the Inter secretariat Working Group on National Accounts. This group includes Eurostat, the IMF, United Nations Statistical Division, the OECD, and the World Bank.
[3] These papers include; the original framework presented to the IAG (OECD, 2019), the OECD Going Digital toolkit measurement note (Mitchell, 2021), an SNA Guidance note presented for global consultation (ISWGNA, 2021) as well as an extensive *Handbook on compiling Digital SUTs* (OECD, 2023).
[4] Analysis from McKinsey based on self-selected data shows that across Australia, Canada, the United States and the United Kingdom, the food delivery market is now four to seven times larger than they were in 2018 (Mckinsey & Company, 2021).
[5] It has been well established in several publications that conceptually a good cannot be digitally delivered see (IMF, OECD, UNCTAD and WTO, 2023).
[6] An example of this by the BEA appears later in the paper.

Figure 2: Simplified visualisation of Digital SUT

Supply of products	From which: Digital industries										Output by other industries (by ISIC Categories)							Total Output, other industries	Total Output, other industries of which, were digitally	Total Output, other industries of which, were non digitally	Total Output (Domestic) Industries
	Digitally enabling industries	Digital intermediary platforms charging a fee	Data and advertising driven digital platforms	Firms dependent on intermediary platforms	E-Tailers	Digital only firms providing finance and insurance services	Other producers only operating digitally	Output,Total digital industries	Output,Total digital industries of which, were digitally	Output,Total digital industries of which, were not digitally	Agriculture, forestry and fishing	Manufacturing and other industry	Construction	Trade, transport, accommodation and food	Information and communication	Finance and insurance	Nonfinancial services				
	1	2	3	4	5	6	7	T	T	T	A	B-E	F	G-I	J	K	L+T		T	T	
Products of primary sector (0-1) Manufacturing (2-4) Construction (5) Trade, accommodation, food & bev; transport Finance and Insurance (7 less 72-73) Nonfinancial services (72-73, 8 and 9)	Seven additional industry columns of types of digital industries								shown by nature of transaction (digitally delivered)		Other industries								shown by nature of transaction (digitally delivered)		
All products Digitally ordered Not Digitally ordered	products are shown by nature of transaction (digitally ordered or not)										products are shown by nature of transaction										
Digital intermediation services																					
Cloud computing																					
ICT goods and digital services																					

Source: IMF.

Importantly the breakdown of the nature of the transaction into rows (for digitally ordered – Yellow shaded rows in Figure 2) and columns (for digitally delivered – Colum's 'T' in Figure 2) allows the compiler to record all the different interactions between producers and consumers as all four ordering and delivery possibilities are represented. These are:

i) digitally ordered and digitally delivered.
ii) digitally ordered and non-digitally delivered.
iii) non-digitally ordered and non-digitally delivered; and
iv) 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.

b. Digital products

From a product perspective, the framework compiles aggregate expenditure on ICT goods and digital[7] services that fall within the SNA production boundary. 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). This definition is taken from the 'alternative structures' section (part 5) of the Central Product Classification - CPC 2.1 (UNSD, 2015) and is considered the product equivalent to the ICT sector outlined in the International Standard Industrial Classification (ISIC Rev.4) (UNSD, 2008).

[7] ICT goods and digital services correspond to the CPC Rev.2.1 list of ICT products (United Nations, 2015).

In the conventional SUTs, ICT goods and digital services that make up the alternative structure may be recorded across many product rows. As such, portions of these product rows should, in principle, be aggregated to form two high-level rows: ICT goods and digital services[8]. An exception to this is the two product rows which separately record two specific digital services; digital intermediation services (DIS) and cloud computing services (CCS)[9]. Both products are of considerable policy interest, but despite this neither is separately recorded in the current standards for product classification[10]. Therefore, information on the production and consumption of these products is currently scarce.

By aggregating ICT good and digital services, an easily interpretable indicator, representative of the increasing importance of these inputs to the production process is created. Similarly, the increasing level of final consumption, both government and household, on ICT goods and digital services is easily represented. While by separately identifying the two specific products (CCS and DIS) businesses investment decisions and the switch to purchases made via independent third parties, made possible via technological advancement can be better represented.

c. Digital industries

The 'who' perspective of the Digital SUTs relates to the derivation of aggregates for new digital industries. These industries are shown in separate columns to re-aggregate the output and value added of units in a way other than their underlying productive activity[11]. At present, seven digital industries have been identified:

- **Digitally enabling industries:** This includes units that produce goods and services that enable the digital transformation to occur, such as IT equipment, computer software and telecommunication services. This industry category corresponds to the ICT sector identified within the International Standard Industrial Classification (ISIC Rev.4) (UNSD, 2008)
- **DIPs charging a fee**: This includes units 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). Examples would include rideshare, online reservation service providers.
- **Data and advertising driven digital platforms:** This includes 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. Examples would include most social media platforms and information sharing sites.

[8] 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.

[9] In figure 2, these are represented as the blue and orange shaded rows respectively.

[10] A revision to the international product classification (CPC 2.1) is currently underway, under the auspices of the United Nations Expert Group on international statistical classifications. This revision will explicitly acknowledge Cloud Computing Services and Intermediation Services as a standalone class of products.

[11] In figure 2, these are represented as the green shaded columns.

- **Producers' dependent on intermediation platforms:** This includes units that sell most of their goods or services via the intermediation platforms mentioned above. Examples include drivers who obtain business via rideshare platforms or handcraft producers who rely on marketplace websites to sell their goods.
- **E-tailers**: This includes traders engaged in purchasing and reselling goods (i.e. retailers) who receive most of their orders digitally.12
- **Producers predominately providing financial and insurance services digitally**. This includes 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. Examples include online only financial service providers and digital payment providers.
- **Other producers only operating digitally.** This includes units operating exclusively online that are not included in one of the previous six digital industries.

The digital industries classify producers by how they utilize digital technologies within their business models, rather than the fundamental type of economic activity undertaken[13], which is the basis for classification in the conventional SUTs[14] and other economic statistics. For example, this means that two economic entities that are currently classified in separate ISIC industries due to their fundamental economic activity (e.g., an online only newspaper - publishing services, and an online only education provider- education services), will be placed in the same digital industry within the Digital SUTs since both units are exclusively receiving orders digitally and digitally delivering their service. In this example both would be placed together in "other producers operating digitally".

4. Policy areas that the Digital SUTs can help to inform

Many areas of economic policy are being significantly impacted by digitalization. While the production of a single number, representative of the entire "digital economy" might be easy for users to understand (at least in a general sense), it is of little policy use. An increase or a decrease in growth of such an aggregate may be attributable to any number of things. As an alternative, the Digital SUTs framework yields a suite of detailed indicators that can be used to develop policy in the following areas (among others).

a. Taxation

Digitalization has provided greater scope for firms to export products to markets without having a physical presence in that market. This ability to "scale without mass" (OECD, 2018) afforded by the advancement of digital technology has resulted in international tax rules based on a "brick-and-mortar" economic environment, no longer being fit for purpose. Besides corporate taxation, rapid digitalization has also created considerable challenges for indirect taxation frameworks both globally and domestically. Often Value-added tax (VAT) is the single largest

[12] 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.

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

[14] This basis for classification in the SUTs follows similar practices in the classification of groups, sections, and divisions in the international industry classification, whereby the "actual production process and technology used become less important as a criterion for grouping activities" (UNSD, 2008).

source of indirect tax revenues (OECD, 2022). However, the collection of VAT on digital platforms with limited or no physical presence in the country of consumption can impact the overall level of tax collected, having some form of indicator of the level of Value Added that is being produced by these units can greatly assist taxation authorities with understanding their tax base[15]. Additionally, many developing countries have begun to institute various indirect taxation legislation related to the digital economy, as such, indicators on digital activity will improve the forecasting of revenue associated with these new taxation policies (UNCTAD, forthcoming).

b. Competition

The policy impacts caused by the emergence of DIPs on the traditional consumer-producer paradigm cannot be overstated. While in theory, DIPs create a greater level of competition, which is advantageous for consumers and the efficient allocation of resources, the market can still be manipulated if the size and reach of a single DIP grows too large. In these instances, DIPs can engage in anticompetitive conduct and rent seeking due to their market power. Examples of this include artificially increased prices for the final consumer (Australian Competition and Consumer Commision, 2022) or reduced revenue for producers (The New York Times, 2023).

c. Skills and labour force

Most industries have incorporated digitalization into their production processes to at least some degree. This does not only impact the products used as inputs but also the level of labour required. Information on these changing inputs into production, including indicators on increases or decrease in the proportion of labour required to undertake production, can assist the government in designing policies that ensure workers entering the workforce have the appropriate skills. Additionally, the Digital SUTs can provide greater information on the contribution to overall output of workers as they shift to more mobile labour and "gig" work. This trend is already well established with data from the UK showing that the percentage of people who found work via an online platform increased from 11.5% in 2016 to 22.6% in 2021 (Spencer & Huws, 2021).

d. International trade

Digital trade, defined as "*all international trade that is digitally ordered and/or digitally delivered*" (IMF, OECD, UNCTAD and WTO, 2023) is becoming an increasingly important component of trade agreements between countries. For example, in 2020, there were 113 such agreements with digital trade provisions, representing 34% of all agreements notified to the World Trade Organization (WTO) (Lopez Gonzalez, Sorescu, & Kaynak, 2023). Greater information on imports and exports that are digitally ordered or delivered is therefore of relevance.

[15] Importantly, as pointed out by the handbook on measuring digital trade, VAT information itself can be an insightful source with which to measure certain elements of digitally ordered trade and digitally delivered trade (IMF, OECD, UNCTAD and WTO, 2023).

e. Business investment and service delivery

The internet has enabled easier communication and a connectedness previously unseen. Due to this, services that previously had to be provided face-to-face are increasingly delivered digitally. Such a trend impacts investment decisions for the private sector in a range of ways including beyond the appropriate size of their physical footprint. For example, a changing focus on fulfilment centres rather than traditional stores (Walmart, 2022). Such decisions are not limited to the private sector and developed economies. Several African countries have begun the process of improving government service delivery through digitalization. Namibia and Gabon are both developing a centralized digital platform that will provide easier access to government services including accepting e-payments, Kenya has successfully introduced a digital "iTax" portal, while Tanzania has instigated an e-government authority (https://www.ega.go.tz/) to oversee the government digital transformation (European Investment Bank, 2021). Providing information on digital ordering and digital delivery, especially from the perspective of a time series can inform users on which services have seen a quicker or larger pick up in being provided digitally.

5. Priority indicators for developing countries

The Digital SUTs framework was constructed with the purpose of being applied to SUTs. Due to the comprehensive and exhaustive nature of the SUTs, this approach was seen as the best opportunity to capture all facets of digitalization in the economy and although SUTs are not produced by all countries, every year, their compilation is growing both in geographical coverage and frequency of production[16]. That said, many countries still do not have SUTs or produce them infrequently, however, the principles of the Digital SUTs framework can be applied flexibility to produce estimates of digital activity.

This flexibility includes applying the fundamental concept of breaking up aggregates based on either the nature of the transaction, the products being transacted or the actor producing the output to a wide range of National Account estimates. While the methodology as outlined earlier in the technical note, includes applying these concepts to individual product rows or industry columns within the conventional SUTs, they can also be applied to higher level aggregates, including those that are compiled independently of the SUTs.

The fundamental compilation strategy for producing the Digital SUTs is to apply some form of complementary indicator to a national account estimate previously compiled in the SUTs. This can be done either at the detailed product row (i.e., legal & accounting services, financial services, etc.), at a more aggregated level (all professional services, all manufacturing) or even at the total economy level (total output, total household consumption). As will be shown below there are many examples where aggregate national account totals have been broken up to provide information on digitalization without the need for doing this at the row or column level within the SUTs. However, while the delineation can be made without re-aggregating an entire SUT, some form of complementary

[16] An example of their continuing development, in 2017 the Asian Development Bank put together a compendium of SUTs compiled by Asian countries (Asian Development Bank , 2017), this includes summary SUTs for 19 predominately developing countries. Similarly, the United Nations Economic Commission for Latin America and the Caribbean (ECLAC) created a repository of SUTs for its region (UN ECLAC, 2020), which contains SUT's for 18 Latin American countries and 3 Caribbean countries for the years 1988 to 2019.

indicator (often survey results) which provides information on either digital ordering or delivery from either the production or consumption perspective is usually required.

Based on the aim of providing the most useful information while also being cognisant of the compilation challenges faced by many developing countries, this technical note recommends the following priorities which use well established national accounts aggregates as the basis.

- Proportions of output that was digitally ordered or delivered, either at the total economy level or at aggregated industry level.
- Proportion of total household final consumption digitally ordered or digitally delivered.
- Estimates of output and gross value added produced by identified digital industries.
- Total imports and exports considered as part of digital trade (international transaction either digitally ordered or digitally delivered)

a. Proportions of output that were digitally ordered or are digitally deliverable

Based on experiences of countries that have already compiled estimates, information on digital ordering is usually captured via business surveys (UNCTAD, 2023). These surveys are based around the activity being undertaken by the units and as such the results from these surveys are usually broken down based on activity. If such industry-based information is available, depending on the composition of products being produced, assumptions could be made to apply these proportions equally to the specific products produced by this industry.

Such an approach was undertaken by the CSO Ireland. The CSO used aggregate proportions for each industry obtained through the ICT enterprise survey and applied these to total output by product. Due to this they were able to easily build up an estimate of the proportion of digital ordering for each aggregated industry classification based on the products being produced by that industry classification.

A slightly different approach was undertaken for digital delivery, as products were either considered digitally deliverable or not based on a previously established list of digitally deliverable products[17]. Based on this delineation, the aggregated proportion of digitally deliverable products was able to be calculated using the Supply table of the SUTs.

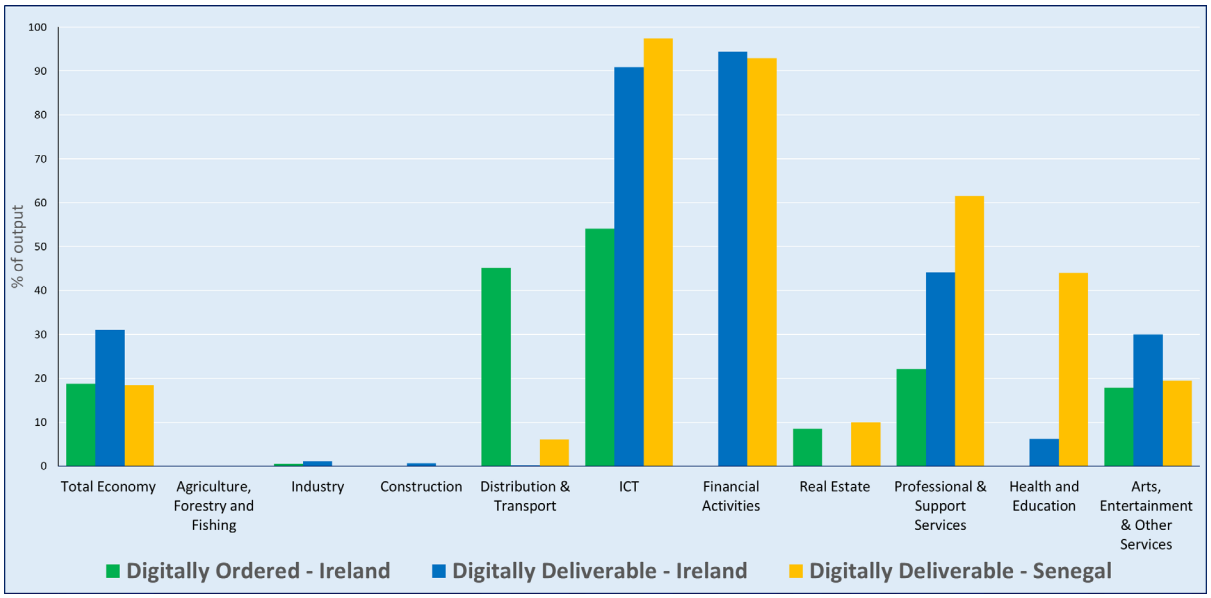
The published classification used by CSO is quite aggregated with only ten different industry groupings covering their entire economy (See Figure 3). These aggregated levels tend to match the conventional industry-based estimates of output and gross value added compiled as part of the production approach to measuring GDP. Due to the availability of data, the Irish CSO was able to apply their indicator at a low level and aggregate up, however, the indicator can be applied at a higher level when necessitated by the unavailability or quality of more detailed product breakdowns.

The data from Ireland showcases an important distinction between estimates of digital ordering and digital delivery, including why it is useful to measure them separately. For example, the ICT survey used by Ireland as

[17] This list of "digitally deliverable services", was originally labelled as "potentially ICT-enabled services" and 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 and WTO, 2023) to include digital intermediation services provided by DIPs, the list is provided in Annex A.

an indicator reported that 54% of ICT output was digitally ordered, however when delineated between digitally deliverable or not, based solely on the type of product within the aggregate, over 90% of ICT output was considered digitally deliverable (See figure 3). There are real world reasons for this difference, many services (including telecommunication) that are considered digitally deliverable, are still often purchased physically. Additionally, in most countries, where data is available, the two indicators are measured in different ways. The calculation of digital ordering is usually based on collected information from additional surveys, such as ICT surveys. Digitally deliverable however, is usually based exclusively on the type of products being produced.

Figure 3: Percentage of output digitally ordered or digitally deliverable, Ireland, 2020; Percentage Digitally deliverable, Senegal, 2018



Source: (CSO Ireland, 2022), authors calculation with (OECD, 2023)
Notes: Health and education include public administration. Estimates for Senegal have been compiled using only publicly available data and should not be considered of similar quality to Ireland.

Therefore, since the estimates of digitally deliverable services can be calculated using solely the Supply sheet of the SUTs (along with the aforementioned list of digitally deliverable services included in the handbook on digital trade), data can be produced for any developing country that is compiling SUTs or alternatively has information on output classified by product.

For example, Senegal has a long history of compiling SUTs, so by using the supply of products in basic prices available in these SUTs, the percentage of output for Senegal that is digitally deliverable can be relatively easily calculated and aggregated to the same level as Ireland, allowing for a clear comparison (See figure 3)[18]. A detailed explanation of the steps involved in producing the estimate for Senegal is provided in Annex B.

[18] There are still some assumptions in this methodology. Most revolve around the concordance between the product classification used in presenting the Supply table (Classification of Product by Activity – CPA) and the classification used in the Digital SUT handbook, listing the services considered digitally deliverable, (Central product classification 2.1 – CPC 2.1). CPC 2.1 is more detailed meaning that on occasions the CPA is made up of both digitally deliverable products and non-digitally deliverable products. Therefore, assumptions must be made to determine how much of the CPA category to consider as digitally deliverable. See Annex B for more information.

Overall, the proportion of digitally deliverable product produced in Senegal is slightly less for the entire economy, likely due to the relatively higher amount of Agriculture and Mining output produced in Senegal, none of which is digitally deliverable. When specific service categories are compared, the composition of services produced in Senegal results in slightly higher proportions of digitally deliverable products, for example in ICT services and Professional and support services. Here it is important to note that while theoretically comparable, there is a significant amount of difference in the quality of the outputs presented in Figure 3. Those for Ireland, which have been produced by the CSO using lower level unpublished statistics are of much higher quality than those presented for Senegal, compiled using only publicly available information, specifically for use in this technical note. While this work shows that it is relatively straight forward to produce some initial outputs of the Digital SUTs framework, in order for them to be used for statistical analysis, its vital that more detailed, unpublished statistics are used by the statistical office to produce the estimates. Using this additional information would allow, in the case of digitally deliverable estimates, for more accurate concordance proportions to be calculated rather than estimated as is done in this case.

b. Proportion of total household final consumption digitally ordered or digitally delivered

i. Digitally ordered household final consumption expenditure

The shift by private households toward online ordering and delivery is one of the most obvious manifestations of the digital economy. Currently, many countries produce estimates of online retail transactions or e-commerce more broadly. However, these are usually on a slightly different statistical basis to the national accounts and thus cannot be represented as a proportion of GDP or household final consumption expenditure, which often provide important context to these estimates.

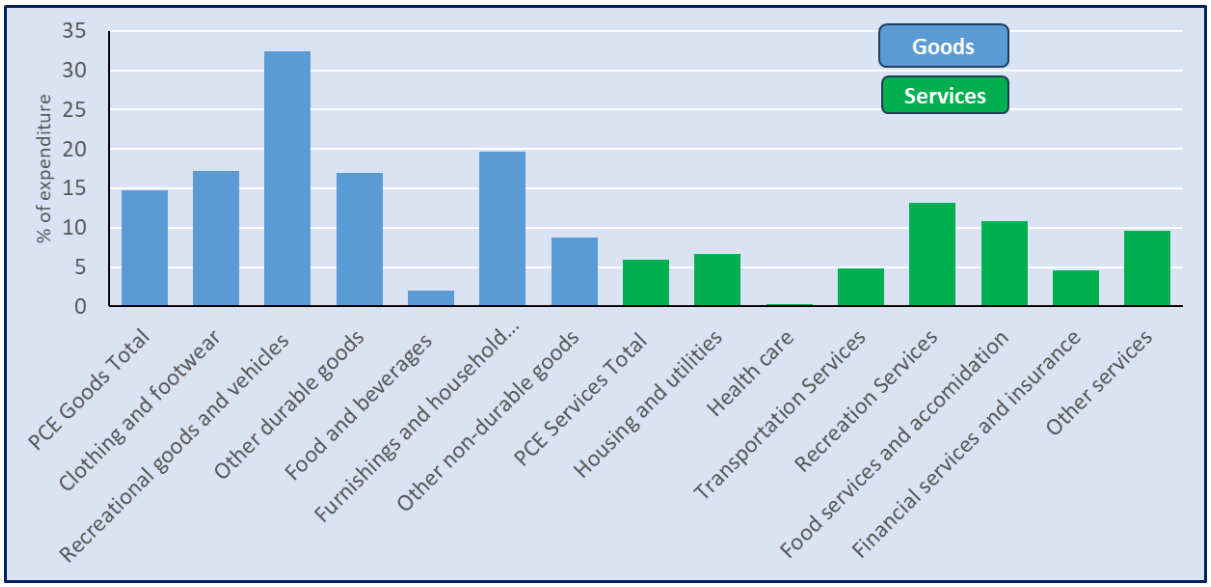
Theoretically, within the Digital SUTs, the proportion of Household Final Consumption Expenditure (HFCE) that is being digitally ordered is calculated by summing up the digitally ordered proportion of each product which is contributing to household final consumption expenditure aggregate. This requires information on the nature of the transaction for each product. To date, most countries have not obtained this level of detail, rather estimates have been generated by applying more aggregated estimates of digital ordering (i.e., e-commerce) to more aggregated estimates of HFCE. Household Final Consumption Expenditure is usually produced during the compilation of the expenditure approach to GDP, either as an aggregate estimate or delineated by the type of product, permitting the calculation of digitally ordered proportions without an SUT.

A good example of this approach comes from the United States Bureau of Economic Analysis (Bureau of Economic Analysis, 2022)(see Figure 4). This shows that overall, even before the pandemic, 14.7% of goods consumed as personal consumption expenditure were digitally ordered, with higher proportions observed for recreational goods and vehicles, furnishing and durable household equipment and clothing and footwear[19]. From a services perspective, while the overall proportion of digital ordering was lower at 5.9% of total services, this was weighed down by the very small amount of health services that were digitally ordered; although online tele-

[19] The BEA's measure of personal consumption expenditure is defined as "the goods and services purchased by persons." This can be considered commensurate with the SNA term of Household Final Consumption Expenditure defined as "expenditure incurred by resident households on consumption goods or services."

consultations exist and health services are considered digitally deliverable, most of the overall health output is still ordered and delivered in person.

Figure 4: Proportion of digitally ordered personal consumption expenditure, United States of America, 2019



Source: (Bureau of Economic Analysis, 2022)

This work shows that detailed product level estimates applied to each row of the SUTs are not required to create usable outputs consistent with the Digital SUTs framework and the National Accounts more broadly. While the work undertaken by the BEA is a high-quality example with 13 different categories, there is no minimum or maximum number of classifications that must be completed. Several developed countries have applied the indicator to total HFCE, producing just an overall total for digitally ordered HFCE (Statistics Netherlands, 2021; OECD, 2023).

In the absence of SUTs, the approach can equally be applied against the HFCE estimates compiled as part of a standard compilation of the annual national accounts. This compilation is usually a single aggregate estimate or presented via a different classification such as Classification of Individual Consumption According to Purpose (COICOP) or North American Product Classification System (NAPCS). In these circumstances, countries can compile estimates of digitally ordered household final consumption expenditure at either the aggregate level or if the data do not allow for this, at a specific product or classification level such as clothing, food, accommodation, without trying to compile exhaustive estimates for all products. Such an approach would still provide usable information that likely covers the products most impacted by e-commerce while also providing a pseudo "lower bound" estimate for the proportion of total household final consumption expenditure that was digitally ordered.

ii. Digitally deliverable household final consumption expenditure

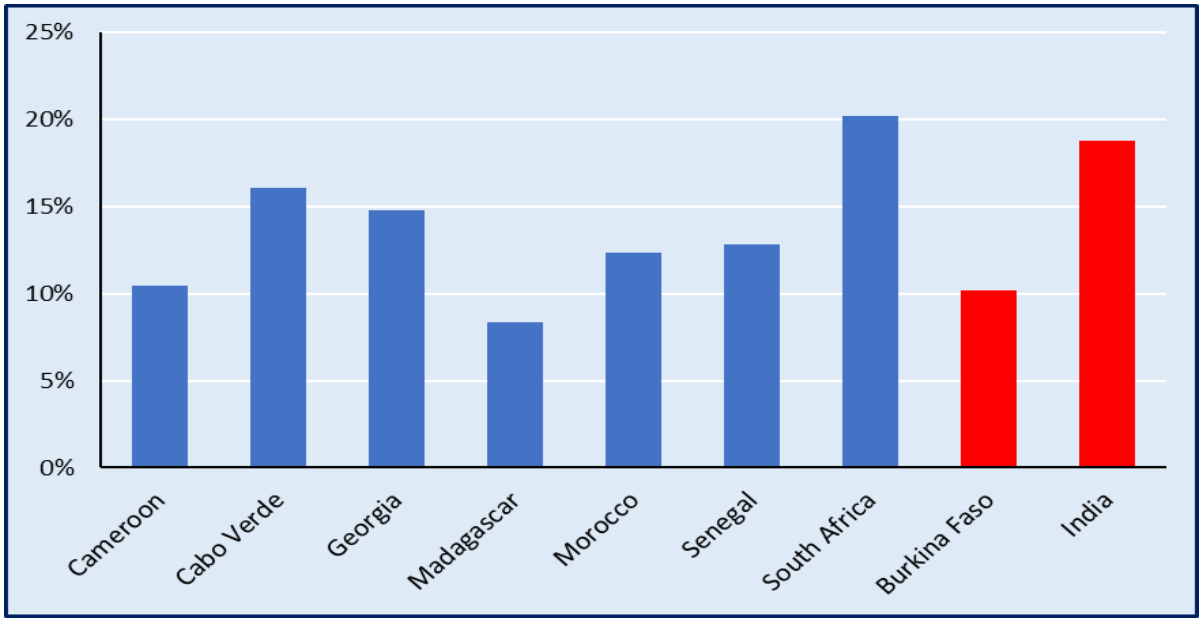
Estimates of digitally deliverable HFCE can be calculated using a similar approach to digitally deliverable output. Since the estimate is based on the products that are being produced, or in this case consumed, no additional

information is required. Rather the proportion of digitally deliverable consumption is calculated based on the composition of the services making up HFCE.

Figure 5 shows the proportion of HFCE considered digitally deliverable for a range of developing countries for 2018. The method for producing these estimates is similar to that employed for calculating the proportion of output that is digitally deliverable. This is presented in detail in Annex B.

The estimates show a consistent proportion of HFCE being spent on products considered as digitally deliverable. In most countries, Telecommunications, Health services and Financial services are the predominant digitally deliverable services consumed by households.

Figure 5: Proportion of Household Final Consumption Expenditure considered digitally deliverable; selected countries, 2018



Source: UNCTAD calculations, based on OECD (2023).

While most digital indicators in figure 5 were compiled based on the demand tables of the SUTs, the final two countries in red (Burkina Faso and India) were produced by applying proportions to HFCE estimate produced independently to the SUTs. The flexibility of the Digital SUTs framework means that results can be derived from a wide variety of national account estimates beyond the SUTs. The only difference between the calculation of the countries in blue and those in red is the concordance used. For outputs based on the SUTs, the list of products considered as digitally deliverable would need to be converted from CPC 2.1 (which is how the list is presented in the Handbook on Measuring Digital Trade (IMF, OECD, UNCTAD and WTO, 2023) and Handbook on Measuring Digital SUTs) (OECD, 2023) to whichever classification is used in the SUT (i.e. CPA, NAPCS, etc.). Conversely, HFCE compiled as part of a regular annual publication is usually presented split by COICOP (or a regional equivalent), therefore necessitating a concordance between CPC 2.1 and COICOP. A more detailed rundown of the process undertaken to produce the digitally delivered HFCE estimate for Burkina Faso is included in Annex C, however, it appears likely that the chosen compilation approach has minimal impact of the results.

A final consideration regarding estimates of digitally deliverable HFCE is that while compiling estimates of digitally deliverable is a useful first step, both developed and developing countries should strive to collect more precise estimates of the amount of services actually being digitally delivered, rather than an estimate of the amount that is digitally deliverable.

c. Estimates of output and gross value added produced by identified digital industries

Digitalization is often considered a pathway for increased productivity, therefore a clear desire from users is for information on how much economic units and actors in the economy that are reliant on digitalization for their business models contribute to the overall size and growth of the economy. As such, information on the output and value added of the digital industries explicitly identified in the Digital SUTs framework is a high priority for countries. The digital industries presented earlier in this technical note are considered significant enough to measure and to be of interest from policy makers. However, this may change over time as the digital economy continues to evolve.

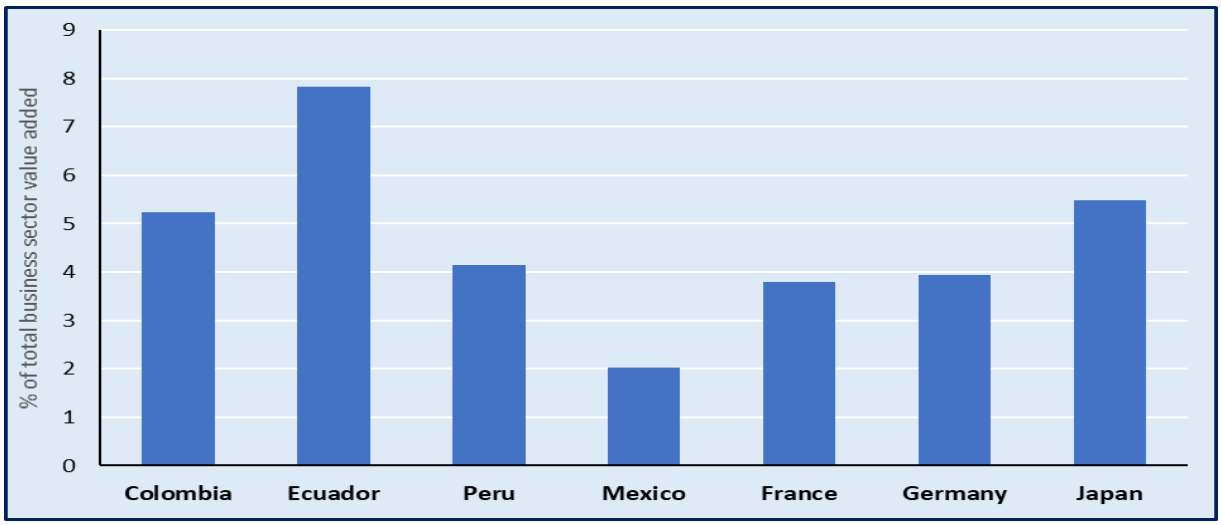
As noted in the (OECD, 2023) Digital SUTs compilation Handbook, the methods for deriving outputs associated with digital industries fall into two categories. These are:

- **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. This method relies on having a relatively robust business register as well as a high level of formality in the economy.
- **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 compilation of the digitally enabling industry and DIPs charging a fee is easier if undertaken by reallocating specific units across industries, while the e-tailers and producers dependent on DIPs industries are more easily compiled using the indicator method. For developing countries, which may have a large amount of informal activity or lack a robust business register, it is likely that the indicator method is more suitable for most industries.

That said, the ICT sector, which makes up the "digitally enabling industry", has been well defined since the publication of ISIC 4.0 in 2008 (UNSD, 2008), therefore estimates of value added of this sector are widely available. UNCTAD, for example collects countries' statistics on the value added for the ICT sector for a range of countries, including many developing countries. Figure 6 shows the value added of the ICT sector, as a proportion of overall value added for the business sector (ISIC divisions 10 – 75), for several Latin American countries, ranging from 2% in for manufacturing focused Mexico to nearly 8% for the more primary industry driven Ecuador. When compared with selected developed countries, the size of the ICT sector relative to the size of the total economy is quite comparable, suggesting that the universal nature of digitalization may result in similar levels of enabling activity being required across the world.

Figure 6: Value added, ICT sector; percentage of total business sector value added, Selected countries, 2019

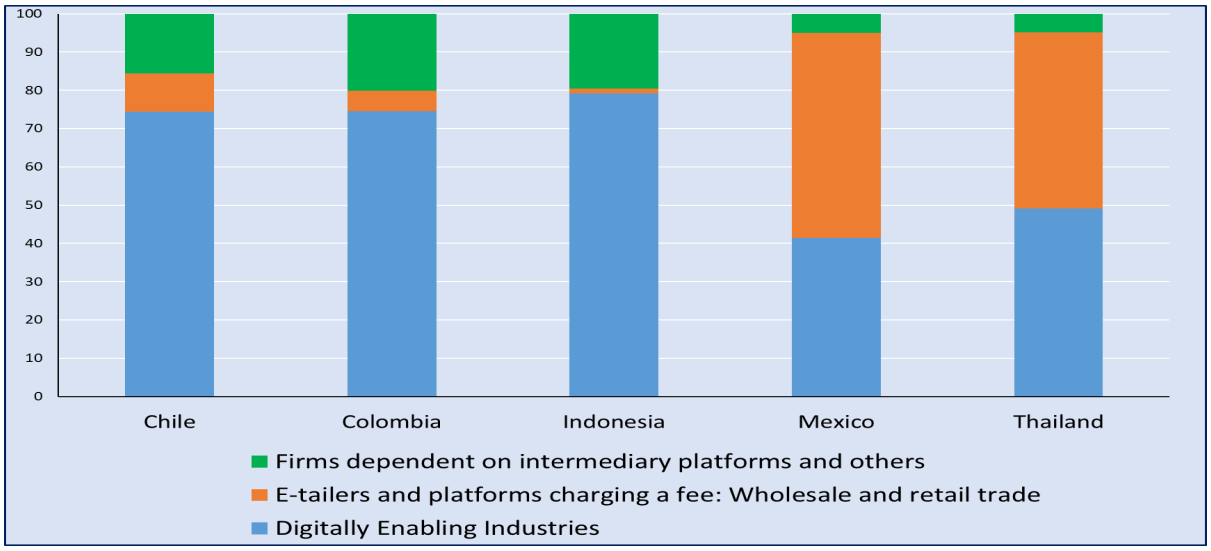


Source: (UNCTAD, 2023)
Note: Peru is 2018, Mexico is 2020, Business sector corresponds to ISIC divisions 10 – 75, for more information see (UNCTAD, 2020)

The IMF used a range of methodologies to derive estimates of value added during a project with developing countries in 2022. As well as calculating Gross Value Added (GVA) based on the output of explicitly identified units (such as those within the ICT sector), the IMF used the indicator method for certain digital industries such as E-tailers and Digital Intermediation Platforms. This approach uses independent indicators to reallocate a proportion of output and value added to the new digital industry, without identifying any specific units allocated to this digital industry. For example, supplementary data is used to identify the digitally ordered proportion of value added for certain industries such as Accommodation services and Travel agencies, Tour operator and Other Reservation Services. On occasions the NSOs themselves identified economic units that fit the characteristics of the digital industry and they were manually moved to the new classification. Importantly, the starting point for reallocating output and value added was not always the SUTs. Estimates of output and value added, compiled on an industry basis as part of the production approach to GDP, were broken up based on the supplementary data.

With assistance from the IMF, Chile, Colombia, Indonesia, Mexico, and Thailand, all generated estimates of GVA broken up based on the digital industries that produced it (See figure 7). While the Digitally enabling industry produced the largest amount of value added in most economies, the contribution from e-tailers and Digital Intermediation Platforms as well as the firms dependent on them, were significant.

Figure 7: Value added of digital industry, contribution to total digital industries value added, selected countries



Source: (IMF, 2022)

Overall, while slightly differing methodologies were applied in each country, usually due to the variances in data availability, including the availability of SUTs; a broad comparability was still maintained since each country used the same definitions for the digital industries listed in the Digital SUTs framework. Fundamentally, when compiling the industry perspective in the Digital SUTs framework the initial data used is irrelevant. There is no need to present a full product by industry perspective as is done in the SUT for the new digital industries, therefore the SUT columns are the suggested starting point purely as this is seen as the most comprehensive summary of the economy. Rather, the most important aspect is aggregating output and GVA from economic units based on a new defining characteristic, how they leverage digitalization, as such, estimates of output and GVA for the whole economy or the market sector are all that is required not detailed information on the goods and services produced.

d. Digital trade – International trade transactions digitally ordered and/or digitally deliverable

Digital trade appears in Digital SUTs since the SUTs include total imports and exports. However, since trade statistics are often compiled independently of the national accounts, they are often available as a separate output.

From a trade perspective, key indicators are the total imports and exports that are digitally ordered and total imports and exports that are digitally delivered.

With regards to digitally delivered transactions, although several countries including Costa Rica and India, working with UNCTAD, have implemented the measurement of digitally delivered trade transactions, such statistics are not widely available across countries (IMF, OECD, UNCTAD and WTO, 2023). For this reason, the trade in digitally deliverable services (those which can be delivered remotely over computer networks) have become a high-profile indicator. The usefulness of this indicator has previously been noted and has been a point of focus for UNCTAD for some time.

A simple aggregation of product level export data can be used to create estimates. Importantly, while this can be compiled using the product rows presented in the demand table of the SUTs, it's equally possible (even more

straightforward) to compile this indicator using any source of services export statistics broken down by products [20]. Indeed, this is the approach taken in UNCTAD's published dataset on trade in digitally deliverable services[21], which is compiled from services by product data collected jointly by UNCTAD and the WTO.

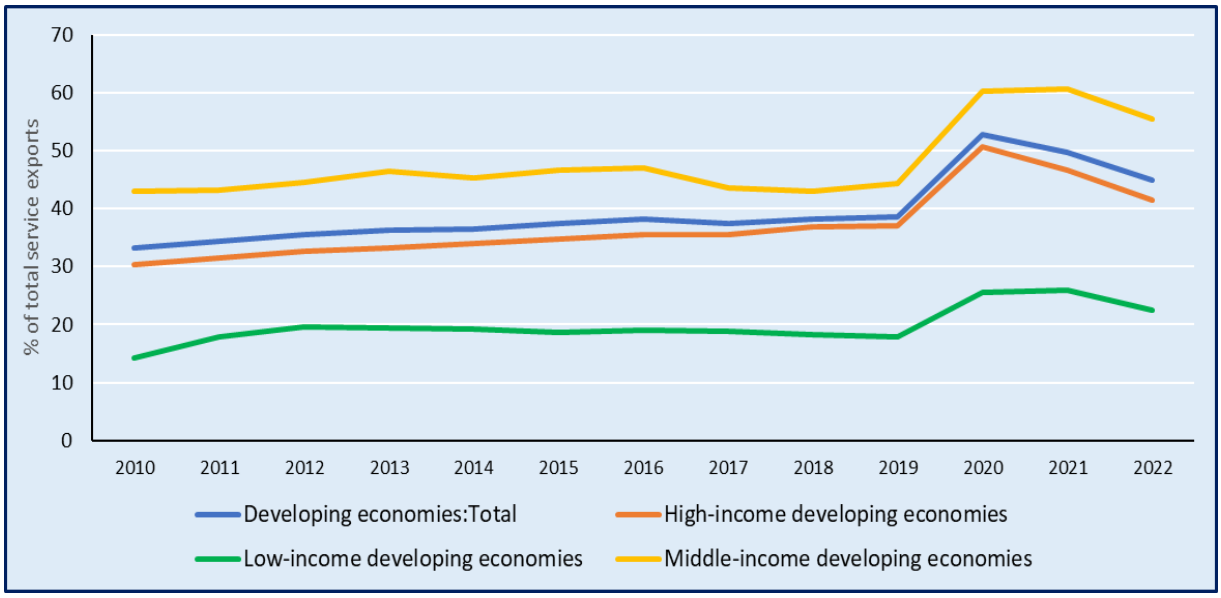
Building upon this dataset, the WTO has developed an approach for estimating the portion that is actually digitally delivered through applying the Eurostat-WTO model for allocation of services products by mode of supply (IMF, OECD, UNCTAD and WTO, 2023), (WTO, 2023).

Statistics or estimates for digitally delivered trade are vital, since for developing countries, this is a key area of potential income generation and economic growth. Digitally deliverable exports have consistently grown as a proportion of all service exports for all categories of developing countries in the past 12 years (see figure 8).

More specifically, figure 8 shows a large relative increase in digitally deliverable trade during the pandemic, as these types of services were more likely to continue being traded throughout lockdowns in comparison to physically delivered services. As trade in other services has returned to normal levels, digitally deliverable services have declined from their pandemic led peak, however, the overall trend of growth in these products for developing countries is clear. Both Telecommunications Services and Professional and Management Consulting Services are the two key categories driving this higher proportion of total services across developing countries, a trend that is consistent across both income tier and geographical location.

[20] This can also be compiled based on Mode of supply, for more information refer to the Handbook on Measuring Digital Trade (IMF, OECD, UNCTAD and WTO, 2023).
[21] https://unctadstat.unctad.org/datacentre/dataviewer/US.DigitallyDeliverableServices

Figure 8: Digitally deliverable exports, Developing countries (2010 – 2022) percentage of total exports in services



Source: (UNCTAD, 2023)

6. Path forward

This technical note has set out a range of actions that countries, including developing countries with a limited statistical basis to work from, can take to begin compiling Digital SUTs or key indicators following the principles of the Digital SUTs framework.

The first step is to look at the availability of statistics that can be used as inputs to key indicators in the Digital SUTs framework. This technical note provides a basis for starting that assessment, and highlights that some indicators can be created using data and information already at the disposal of many developing countries. In 2023, the OECD will release a handbook on compiling Digital SUTs (OECD, 2023), which will include detailed definitions on the products and industries included in the framework. Additionally, the handbook includes a long list of case studies and examples by countries who have undertaken related work.

Business ICT usage surveys can be a key source for information needed to complement/break down aggregates from the SUTs/National Accounts. Information from such surveys were the main complementary source used by Sweden and the Netherlands when producing their initial estimates in the framework of the Digital SUTs. The UK has published results from a "digital economy survey" which asks respondents directly about the nature of their transactions (UK Office of National Statistics, 2023). The United States census bureau also included similar questions in their annual business surveys, such as their annual services survey (United States Census Bureau, 2021). Developing countries are also beginning to undertake ICT surveys. UNCTAD's 2023 report, *Measuring the value of E-commerce* (UNCTAD, 2023), contained many examples including those from Indonesia, Maylasia, Mexico, the Philippines, and Thailand.

It is not necessary to complete the full Digital SUTs matrix or even use SUTs as a starting point for this compilation. Rather, there are indicators that are obtainable now using aggregates usually compiled as part of the

conventional production of GDP. The underlying principles of Digital SUTs can be applied to these aggregates so that internationally comparable indicators on digital activity can be compiled.

Countries should share experiences and initial estimates they compile through fora such as the UNCTAD Working Group on Measuring and e-commerce and the digital economy. The flexibility afforded by the Digital SUTs framework means that countries need not wait until they have all outputs available and produced to a specific level of quality before publishing. Rather countries can publish the different perspectives (transactional/ industry / product) at different times, without any impact on the interpretability of the output. Publishing experimental estimates facilitates discussion and improvement.

The work of UNCTAD's Task Group on measuring e-commerce value (TG-eCOM) will potentially support the compilation of Digital SUTs. Digital ordering is one of the key concepts within the frameworks for Digital SUTs and for digital trade. As the definitions of digitally ordered and e-commerce transactions are aligned, the work of the TG-eCOM to broaden the availability of robust and internationally comparable statistics on ecommerce value will also support the availability of statistics that can be used in the context of Digital SUTs.

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Annex A. 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
612	Wholesale trade services on a fee or contract basis
621	Non-specialized store retail trade services
622	Specialized 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
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
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	Investigation services
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	Specialized 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: (OECD, 2023) based on (IMF, OECD, UNCTAD and WTO, 2023)

Annex B. Compilation of estimate of output considered digitally deliverable

The compilation of estimates of output that are digitally deliverable is achieved in several steps, some of which may require a certain amount of subjective decision making, depending on the economy it is measuring. In the case of Senegal, the starting point is the final three columns of the Supply table compiled as part of the conventional presentation of the SUTs. A summarized version is shown in figure B.1.

Figure B.1 Supply table, Senegal, 2018

	A	C	D	E	F	G
	Senegal, 2018, Current Prices					
	CFA Franc - BCEAO, Millions					
	Product	Total supply at basic prices	Output at basic prices, Total activity	Imports, cif	Proportion of product digitally deliverable	Value, Digtially Deliverable
1	**Total Products**	**25732325**	**20839851**	**5378850**		**4584801**
2	**Products of agriculture, forestry and fishing**	**2873128**	**2607086**	**266042**	**0%**	**0**
3	Products of agriculture, hunting and related services	2445757	2182093	263664	0%	0
4	Products of forestry, logging and related services	71390	69641	1749	0%	0
5	Fish & other fishing products, aquaculture prod., support serv. to fishing	355981	355352	629	0%	0
6	**Mining and quarrying**	**1226884**	**751610**	**475274**	**0%**	**0**
7	Crude petroleum and natural gas	380526	1926	378600	0%	0
8	Metal ores	372072	372071	1	0%	0
9	Other mining and quarrying products	435919	339246	96673	0%	0
10	Mining support services	38367	38367	0	0%	0
11	**Manufactured products**	**8525437**	**4717884**	**3807553**	**0%**	**0**
12	Food products	2773489	2085180	688309	0%	0
13	Beverages	225054	194986	30068	0%	0
14	Tobacco products	73236	71083	2153	0%	0
15	Textiles	165572	89973	75599	0%	0
16	Wearing apparel	282477	259037	23440	0%	0
17	Leather and related products	45936	35668	10268	0%	0
18	Wood & prod. of wood & cork, exc. furniture, of straw & plaiting materials	132882	89842	43040	0%	0
19	Paper and paper products	100921	47577	53344	0%	0
20	Printing and recording services	49890	46876	3014	0%	0
21	Coke and refined petroleum products	1259736	403936	855800	0%	0
22	Chemicals and chemical products	664891	401347	263544	0%	0
23	Basic pharmaceutical products and pharmaceutical preparations	169576	31485	138091	0%	0
24	Rubber and plastic products	237858	144338	93520	0%	0
25	Other non-metallic mineral products	441463	349911	91552	0%	0
26	Basic metals	614984	217643	397341	0%	0
27	Computer, electronic and optical products	149608	1238	148370	0%	0
28	Electrical equipment	158828	24082	134746	0%	0
29	Machinery and equipment n.e.c.	317573	5484	312089	0%	0
30	Motor vehicles, trailers and semi-trailers	306533	979	305554	0%	0
31	Other transport equipment	96543	62644	33899	0%	0
32	Furniture	90168	65619	24549	0%	0
33	Other manufactured goods	54623	37377	17246	0%	0
34	Repair and installation services of machinery and equipment	113596	51579	62017	0%	0
35	**Electricity, gas, steam and air conditioning**	**620691**	**619762**	**929**	**0%**	**0**
36	**Water supply, sewerage, waste management and remediation services**	**238279**	**238239**	**40**	**0%**	**0**
37	Natural water, water treatment and supply services	144262	144222	40	0%	0
38	Sewerage services, sewage sludge, waste collection & management serv.	94017	94017	0	0%	0
39	**Constructions and construction works**	**1773877**	**1773877**	**0**	**0%**	**0**
40	Buildings and building construction works	606612	606612	0	0%	0
41	Constructions and construction works for civil engineering	846143	846143	0	0%	0
42	Specialised construction works	321122	321122	0	0%	0
43	**Wholesale&retail trade serv., repair serv. of motor vehicles & motorcycles**	**2384762**	**2384762**	**0**		**213910**
44	Wholesale and retail trade and repair serv. of motor vehicles & motorcycles	245666	245666	0	0%	0
45	Wholesale trade services, except of motor vehicles and motorcycles	496088	496088	0	10%	49609
46	Retail trade services, except of motor vehicles and motorcycles	1643008	1643008	0	10%	164301
47	**Transportation and storage services**	**1210707**	**1105479**	**527062**		**0**
48	Land transport services and transport services via pipelines	550593	532674	26984	0%	0
49	Water transport services	15441	16096	408813	0%	0
50	Air transport services	109406	35789	76918	0%	0
51	Warehousing and support services for transportation	519061	504903	14158	0%	0
52	Postal and courier services	16206	16017	189	0%	0
53	**Accommodation and food services**	**411225**	**411225**	**0**		**0**
54	Accommodation services	130510	130510	0	0%	0
55	Food and beverage serving services	280715	280715	0	0%	0
56	**Information and communication services**	**1070339**	**995449**	**74890**		**969611**
57	Publishing services	56488	50685	5803	50%	25343
58	Motion picture, video & TV programme production serv., etc.	9916	9916	0	95%	9420
59	Programming and broadcasting services	42267	42179	88	100%	42179
60	Telecommunications services	860362	811314	49048	100%	811314
61	Computer programming, consultancy and related services	69978	59600	10378	100%	59600
62	Information services	31328	21755	9573	100%	21755
63	**Financial and insurance services**	**605464**	**575386**	**94620**		**534834**
64	Financial services, except insurance and pension funding	425039	405520	19519	90%	364968
65	Insurance, reinsurance & pension funding services, exc. compulsory S.S.	100158	90698	74002	100%	90698
66	Services auxiliary to financial services and insurance services	80267	79168	1099	100%	79168
67	**Real estate services**	**1001121**	**1001121**	**0**	**85%**	**850953**
68	**Professional, scientific and technical services**	**1094759**	**968616**	**126143**		**882283**
69	Scientific research and development services	434037	412982	21055	100%	412982
70	Other professional, scientific and technical services	657207	552119	105088	85%	469301
71	Veterinary services	3515	3515	0	0%	0
72	**Administrative and support services**	**353198**	**346901**	**6297**		**180725**
73	Rental and leasing services	49995	45133	4862	25%	11283
74	Travel agency, tour operator & other reservation services & related serv.	22705	22705	0	100%	22705
75	Security and investigation services	53188	51753	1435	20%	10351
76	Office administrative, office support and other business support services	227310	227310	0	60%	136386
77	**Public administration and defence services, compulsory S.S. services**	**1019834**	**1019834**	**0**	**0%**	**0**
78	**Education services**	**675566**	**675566**	**0**	**100%**	**675566**
79	**Human health and social work services**	**325983**	**325983**	**0**		**214402**
80	Human health services	214402	214402	0	100%	214402
81	Residential care services, social work services without accommodation	111581	111581	0	0%	0
82	**Arts, entertainment and recreation services**	**93688**	**93688**	**0**	**50%**	**46844**
83	**Other services**	**156735**	**156735**	**0**	**10%**	**15674**
84	**Services of HH as employers, undifferentiated G&S prod. by HH for own use**	**70648**	**70648**	**0**	**0%**	**0**

Source: Author's calculations and (OECD, 2023)

Products are listed on each row, while the columns represent the Domestic Output (Column D), Imports (Column E), with the sum of these two columns representing the total amount of products supplied in the economy (Column B). In this supply table the products are represented at the 2-digit CPA level (Classification of Product by Activity). From this list the compiler must delineate the output of the products considered digitally deliverable.

Some of these products are entirely digitally deliverable (e.g., telecommunications services and Programming and broadcasting services), while some are not digitally deliverable at all (e.g., manufactured products), these are therefore simple to separate with those that are digitally deliverable assigned a proportion of 100% and those that are not assigned 0%. However, some product rows contain both digitally deliverable and non-digitally deliverable services. To calculate the proportion of these product rows considered as digitally deliverable, a concordance must be created between the list of services considered digitally deliverable (provided in Annex A) and the CPA classification used for the supply table.

Figure B.1 also shows the proportions applied in the case of Senegal (Column F). The vast majority of products are assigned a zero, since they contain the production of goods, and it is well established that goods are not able to be digitally delivered. It should be noted that the 'margin' products, Wholesale and Retail Trade are each assigned a set proportion of 10%[22]. In the list of digitally deliverable services, these products are quite rightly included, since retail and wholesale services can occur exclusively online or through digital intermediation platforms, however, it was considered that assigning the entire amount of the wholesale and retail margin as digitally deliverable would cloud the final result.

The proportions included in this table were estimated based on how many of the digitally deliverable services listed in annex A are contained within the higher-level CPA classification. For example, the product listed in row 68, "Motion picture, video & TV program production serv., etc." contains almost all services that are considered digitally deliverable, therefore it is considered that 95% of this product is digitally deliverable. Conversely, only a small proportion of the aggregated product in row 76, "Security and investigation services" contains services that are considered digitally deliverable, therefore the proportion assigned to this product is 20%. Ideally, the statistical office would have unpublished output at a more detailed level. Such information would allow for more accurate proportions to be calculated rather than estimated as is done in this case.

After the proportions have been created, the last step is to apply the proportions in column F to the level of domestic output being produced (column D) to derive an estimate of the value of digitally deliverable services produced by the economy. This is shown in Column G of Figure B.1. These estimates at the product level can then be aggregated to whatever level is required for publication. For example, they can be summed together in order to match the ten classifications created by Ireland so that the level of digitally deliverable services being produced in each country can be compared. This aggregation is done in Figure B.2, with the results shown in Figure 2 of the main text.

[22] This 10% is assigned to Wholesale trade services, except of motor vehicles and motorcycles and Retail trade services, except of motor vehicles and motorcycles. Retail and wholesale trade of motor vehicles and motorcycles remains at 0%.

Figure B.2. Proportion of output digitally deliverable, Senegal, 2018

	Proportion digitally deliverable	Total Output	Value Digitally Deliverable
Total Economy	**22.0%**	**20839851**	**4584801**
Agriculture, Forestry and Fishing	0.0%	2607086	0
Industry	0.0%	6327495	0
Construction	0.0%	1773877	0
Distribution & Transport	6.1%	3490241	213910
ICT	97.4%	995449	969611
Financial Activities	93.0%	575386	534834
Real Estate	85.0%	1001121	850953
Professional & Support Services	61.6%	1726742	1063008
Health and Education	44.0%	2021383	889968
Arts, Entertainment & Other Services	19.5%	321071	62518

Importantly once the concordance and the proportions per product have been calculated, this can be applied to other columns in the Supply sheet, such as Imports. Alternatively, since the products rows are the same in both the supply and the demand table, the proportions can also be applied to any column in the demand table such as exports or household final consumption expenditure (HFCE). In fact, these proportions were applied to HFCE for several countries in order to generate the proportion of HFCE displayed in figure 5.

Annex C. Compilation of Digitally delivered HFCE not using conventional SUTs

The compilation of an estimate of Household Final Consumption Expenditure (HFCE) which is digitally deliverable would ideally be undertaken using the demand table of the SUTs. The method for this is similar to that used to derive the level of output, which is digitally deliverable, with the difference stemming from which column of the respective supply and Use tables the proportions are applied too. This methodology is documented in Annex 2.

However, the methodology can even be undertaken by countries that do not produce SUTs. HFCE for instance is usually compiled as part of the standard production of the national accounts. On an annual or quarterly basis, HFCE published either as an aggregate or broken up based on COICOP (Classification of Individual Consumption by Purpose) is widely available and can be used to derive a proportion of the total HFCE that is digitally deliverable. HFCE for Burkina Faso, compiled on an SNA2008 basis is publicly available and has been used as the basis to derive this estimate (See Figure C.1).

Figure C.1 Household Final Consumption Expenditure, Burkina Faso, 2018

A	B	C	D	E	F	G
National Account Item	Category	COICOP	SNA System	Value (CFA)	Proportion digitally deliverable	Value of digtially deliverable expenditure
Individual consumption expenditure of households	Food and non-alcoholic beverages	1	2008	2,561,803,000,000	0.09%	2297899140
Individual consumption expenditure of households	Alcoholic beverages, tobacco and narcotics	2	2008	143,633,000,000	0.09%	128836662
Individual consumption expenditure of households	Clothing and footwear	3	2008	202,843,000,000	0.09%	181947150
Individual consumption expenditure of households	Housing, water, electricity, gas and other fuels	4	2008	831,219,000,000	0.00%	0
Individual consumption expenditure of households	Furnishings, household equipment and routine maintenance of the house	5	2008	304,060,000,000	0.00%	0
Individual consumption expenditure of households	Health	6	2008	163,978,000,000	65.77%	107849830071
Individual consumption expenditure of households	Transport	7	2008	219,064,000,000	0.00%	0
Individual consumption expenditure of households	Communication	8	2008	285,888,000,000	97.40%	278467368797
Individual consumption expenditure of households	Recreation and culture	9	2008	87,263,000,000	50.00%	43631500000
Individual consumption expenditure of households	Education	10	2008	48,499,000,000	100.00%	48499000000
Individual consumption expenditure of households	Restaurants and hotels	11	2008	348,152,000,000	0.00%	0
Individual consumption expenditure of households	Miscellaneous goods and services	12	2008	104,405,000,000	56.21%	58683316582
Individual consumption expenditure of households	Equals: Household final consumption expenditure in domestic market		2008	5,300,807,000,000	10.18%	539739698402

Source: Authors calculation based on (United Nations, 2023)

The methodology of deriving the level of digitally deliverable HFCE is fundamentally the same regardless of if the demand table of the SUT or HFCE split by COICOP is being used. In both cases, a proportion, signifying the amount of that category that is digitally deliverable is applied. The central difference between the two is the concordance used. A concordance is required so that the list of digitally deliverable products outlined in Annex A can be applied to either the highly aggregated 10 basic COICOP categories or the 80 plus product categories that SUTs are often presented at. Ideally NSO would have additional unpublished statistics at a lower COICOP level to assist in deriving the proportions that should be applied.

In creating the estimate of HFCE for Burkina Faso, displayed in Figure C.1, the proportions (outlined in Colum F of table C.1 or in table C.2) were derived based on those created when deriving the estimate of digitally delivered output for Senegal and listed in Figure A.1. The proportions for some products can be transferred directly from the aggregate estimate in Figure A.1 (such as Health, or Communications) while others (Miscellaneous goods and services) are the weighted average proportion of several different SUT categories. The specific links are outlined in Figure C.2. While these proportions contain an element of specificity associated with Senegal, it is primarily a mechanism for transferring the list of digitally deliverable products, originally outlined in the Central Product Classification, to COICOP[23]. If resources permit, a more detailed direct concordance between CPC and COICOP should be undertaken by the NSO.

[23] This concordance is far from a perfect science. The two frameworks CPC and COICOP classify different things, with CPC identifying products (produced goods and services) and COICOP representing expenditure, which may include a mixture of different products combined. As a simple demonstration of this different level of detail, at its lowest level of detail, COICOP contains 338 different categories significantly smaller than the 1200+ categories contained within the CPC.

Figure C.2 Proportion of HFCE categories considered digitally deliverable

Category	Proportion digitally deliverable	Connection to SUT rows (Figure B.1)
Food and non-alcoholic beverages	0.09%	Row 43 divided by 100
Alcoholic beverages, tobacco and narcotics	0.09%	Row 43 divided by 100
Clothing and footwear	0.09%	Row 43 divided by 100
Housing, water, electricity, gas and other fuels	0.00%	Row 35
Furnishings, household equipment and routine maintenance of the house	0.00%	Weighted average of Row 36 & 39
Health	65.77%	Row 79
Transport	0.00%	Row 47
Communication	97.40%	Row 56
Recreation and culture	50.00%	Row 82
Education	100.00%	Row 78
Restaurants and hotels	0.00%	Row 53
Miscellaneous goods and services	56.21%	Weighted average of Row 63, 67, 68, 72, 83
Equals: Household final consumption expenditure in domestic market	10.18%	

Importantly the first three categories Food and non-alcoholic beverages, Alcoholic beverages, tobacco and narcotics, and Clothing and footwear involve expenditure on goods. As has been well established, goods are not able to be digitally delivered, however when using the SUT classification a proportion is assigned to the retail and wholesale margin to represent the retail trade occurring online or through digital intermediation platforms. This is still required for HFCE, however unlike the SUT where the value of the output represents only the retail and wholesale margin, the value represented in the HFCE estimate includes both the retail margin and the value of the underlying good. Due to this, the proportion is divided by 100 in order to more appropriately reflect the proportion of HFCE that is actually paid for the digitally delivered retail and wholesale service. Nuance decisions such as the treatment of wholesale and retail margins should be decided by each country, who are familiar with their economy and can appropriately apply certain assumptions to most accurately reflect the goods and services consumed by households.

Overall, the methodology presented offers an example of how the concepts and measurement approaches outlined for application with SUTs can be applied to a much wider set of national account outputs. Regardless of the specific output used, having estimates that are consistent with the GDP and the SNA more broadly will assist in producing estimates of digitalization that can be easily compared internationally.

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For more information about UNCTAD's work on e-commerce and the digital economy please contact:

E-Commerce and Digital Economy Branch
Division on Technology and Logistics
unctad.org/topic/ecommerce-and-digital-economy
ecde@unctad.org