

15th Meeting of the Advisory Expert Group on National Accounts, 6-8 April 2021, Remote Meeting

Agenda item: 7.4

The Recording of Data

Update on data measurement and valuation.

This paper outlines the different ways in which data may be created in the economy, and describes various options for recording and measurement, building on the preliminary guidance note on data measurement presented at the 14th meeting of the AEG in 2020. The note responds to some of the requests for clarification and the recommendations made by the AEG at this meeting. Specifically, these requests concern further research on the following items¹:

- how to account for the intrinsic value of observable phenomena in the national accounts;
- the possible recording of transactions relating to observable phenomena as rentals or rent and an empirical example covering the sequence of accounts including balance sheets;
- operationalisation of the proposed the sum of cost approach;[...] for example, better determining and articulating [...] which costs should be included (in applying the sum of costs approach); a clarification on whether the actual value of observable phenomena that were paid for (and those that were acquired for ‘free’) should also be included.

The attached paper primarily focuses on how to record and value a data asset. As such, it does not make any recommendations on a preferred treatment. It rather explores the available options with their advantages and disadvantages.

Main discussion points of the paper for consideration by the AEG

The paper proposes an updated (**changes in bold**) definition of data, as provided in the previous TT guidance note, as follows:

Initial definition: *“Data is information content that is produced by collecting, recording, organising and storing observable phenomena in a digital format, which can be accessed electronically for reference or processing. Data from which its owner(s) derive economic benefits by using it in production for at least one year is an asset.”*

Proposed update: *“Data is information content that is produced by **accessing and observing** phenomena; and recording, organizing and storing **information elements** from these phenomena in a digital format, which can be accessed electronically for reference or processing”*

This change speaks to a fundamental question for which the TT seeks guidance, i.e. **which costs should be included in any sum-of-cost calculation?** The creation of data involves two separate components, which, even though technology can allow for these components to occur at the same time, for the sake of valuation, especially using the sum-of-cost approach, need to be clearly defined as “included or excluded”.

¹ See the conclusions at https://unstats.un.org/unsd/nationalaccount/aeg/2020/M14_Conclusions.pdf.

The preliminary guidance note recommended that the value of data should include “*the costs of collecting or acquiring observable phenomena, storing and processing data*”. This was in line with the previous definition of data as “*information content that is produced by collecting, recording, organising and storing observable phenomena in a digital format*”. However, an additional refinement is required, since “collecting and acquiring” may be interpreted narrowly as the cost of simply recording the content digitally using the firm’s technology or it may be interpreted more broadly to include any expenditure required to obtain access to the phenomena in order for them to be recorded.

It is for this reason that the definition has been updated, to clearly define these two stages. The inclusion of costs associated with the second stage (referred to as *recording and processing costs* in the attached paper) has broad support, including from the Digitalisation TT. Preferences regarding the inclusion of the costs associated with the first stage (referred to as *OP procurement costs* in the attached paper) into any new data product (and asset, if used for more than 1 year) are less clear.

To assist with understanding the issue, two basic examples of these costs are included in the paper. One involving the production of a platform, that provides free services in exchange for granting access to OPs and another one where a company explicitly purchases the right to access OP (and therefore observe, record, analyse and store the information associated with them). It should be noted that in the former case, the reference to free services should not be interpreted as opening the option of including the relevant free services within the SNA production boundary; instead, it is being used as a way to approximate the value of the OPs that is being generated by the platform.

The next fundamental question discussed in the paper that directly follows from the previous question is whether the value associated with accessing the OPs, if included in the value of the data asset, is to be recorded as a produced asset or as a non-produced asset. Arguably, this additional value may be the result of the inputs of labour and capital, especially when access is only provided in exchange for the provision of a free service. However, as noted before, the value can also be generated through a simple explicit purchase or as a by-product of producing goods and services, both situations where no additional production is required but potentially a large amount of additional value is added to the data product and asset.

Clear opinions on these two initial fundamental question will provide clarity regarding some of the follow up questions such as recording explicit payments, how data is sold (as a license, as a service etc.), valuation approaches, etc.

Opinions of the TT

After preliminary discussions with the Digitalisation TT, there appears a clear preference to focus on a sum-of-cost approach to valuing data. Therefore, while the *net present value* (NPV) approach remains in the paper attached as a possible alternative, discussions at the 15th meeting of the AEG could focus on the remaining conceptual and practical questions associated with the sum-of-costs approach.

Additionally there seems to be continual agreement on two characteristics of the information content of OPs. Firstly, that they are not the result of production process, and secondly, that even if they are considered to display asset like qualities (a point still not resolved), their recognition in the accounts should be by exception only (e.g. in the case of outright market transactions).

The existing agreement on the first point results in explicit payments for OPs being unable to be recorded as intermediate consumption, including as a rental payment for the use of a fixed asset. That leaves open the options to record explicit payments for OPs as either a rent or a purchase of a non-produced asset.

While the TT agreed with the update to the definition of data to more clearly separate the two components of data production, there is no clear consensus regarding the inclusion (or not) of OP procurement costs. There is general agreement that the inclusion of OP procurement cost would likely cut across expenditure already recorded in the accounts (software) in a similar way that the inclusion of the recording and processing costs would likely include costs that already contribute to the estimation of databases. With this in mind, the point of combining asset classes, as suggested in the existing guidance note, was again raised as a practical solution, although this would perhaps be against users' wishes. The possibility to estimate costs contributing to the data asset separately from software and database assets should be subject to practical testing.

Questions for the AEG

- Should the sum of cost approach, when used to value data assets, be limited to just the recording, storing, and analysing of OPs, or be expanded to include those costs paid by the firm that enable the OP to be accessed for observations?
- Should the inclusion of OP procurement costs be restricted to those acquired on the basis of an outright purchase? Or should a broader range of costs associated with getting access to data be applied?
- If OP procurement costs are included in the sum-of-costs approach, how to delineate the specific costs involved in procuring the OPs, particularly in the case of dual use of an asset (notably procuring OPs and showing advertisement)?
- If OP procurement costs are included in the sum-of-cost approach, should they be considered as produced or as non-produced?
- In the case firms explicitly pay for (getting access to) OPs, should these payments be recorded as acquisitions of non-produced assets, even if the firms don't become the sole economic owner, or should they be recorded as rent?

An update on recording and measuring data in the system of national accounts.

An issues paper, utilising theoretical scenarios.

OECD²

Section 1. Introduction

1. This paper is related to the ongoing discussion on how to record and measure data in the System of National Accounts (SNA). In doing so, it outlines the different ways in which data may be created in the economy, and describes various options for recording and measurement. The note is prepared with the explicit intent to advance the discussion on the conceptual and practical considerations for recording and measurement of data, as discussed by the Advisory Expert Group on National Accounts (AEG). As such, it also responds to requests for clarification and recommendations, as made during its 14th meeting in 2020.³ It should be noted that the paper heavily draws upon two papers previously presented at the AEG, the first in 2018, [Recording and measuring data in the System of National Accounts](#) (Ahmad & Van de Ven, 2018); and the second, the ISWGNA Task Team on Digitalisation's [Draft guidance note on Recording and Valuation of Data in National Accounts](#) (ISWGNA, 2020), presented in 2020.
2. The draft guidance note on recording and valuing of data, presented at the 14th meeting of the AEG, provided an important impetus for the discussion on the recording and measurement of data, by articulating clear definitions related to the various stages in the data value chain and raising relevant questions regarding their recording and measurement. As a follow-up, the AEG asked for further research and examples, to arrive at a more precise set of recommendations. More particularly, the AEG asked for more research on *“how to account for the intrinsic value of observable phenomena in the national accounts”*, as this may provide more insights into *“a valuation of (the intrinsic value of) observable phenomena in data; the possible recording of transactions relating to observable phenomena as rentals or rent; and an empirical example covering the sequence of accounts including balance sheets”* (AEG, 2020). The AEG also expressed the need for further research on the valuation of data, specifically that *“more clarity is needed in order to operationalize the use of the proposed sum-of-costs method (including a mark-up where appropriate) to measure the output of (own account) data”*. Such clarifications could, for example, focus on *“better determining and articulating [...] which costs should be included; a clarification on whether the actual value of observable phenomena that were paid for (and those that were acquired for ‘free’) should also be included; and if included, how to account for paid acquisitions (and in particular what exactly was being purchased)”* (AEG, 2020).
3. This paper primarily focuses on two challenging issues, i.e. how to account for the intrinsic value of a single observable phenomenon (OP) or observable phenomena (OPs); and how to derive the value of the data asset, thereby exploring the available options with their advantages and

² This paper was prepared by Peter van de Ven, Jorrit Zwijnenburg and John Mitchell, for the 15th meeting of the Advisory Expert Group meeting, April, 2021

³ For full agenda, summary and documents see here

<https://unstats.un.org/unsd/nationalaccount/aeg/2020/M14.asp>

disadvantages. Section 2 of this paper starts with a discussion on the role of OPs, and how to account for any of their intrinsic value. Section 3 briefly discusses the different means via which (access to) OPs can be obtained, which may also be of relevance for the valuation of data, depending on the valuation method chosen. These different valuation methods are discussed in Section 4. Section 5 presents examples for the three main routes via which (access to) OPs are obtained by business. For each scenario, the available options for classification and treatment are explored, allowing for an assessment, in Section 6, of how this may affect the main aggregate indicators from the system of national accounts. This is followed by an analysis of the main advantages and disadvantages of each recording option in Section 7, prompting some questions for discussion. Section 8 summarises the paper.

Section 2. The role of observable phenomena, and how to account for them

4. The ISWGNA guidance note on recording and valuing data recommends that with the exception of those that are explicitly purchased, individual observable phenomena (OPs) “*fall outside the SNA production and asset boundary*”. However, while there appears little support to consider an OP as being derived from production and thus being within the production boundary, it is arguable that information on an OP or OPs can be monetised and therefore that they contain some inherent value, and thus could, and importantly should, be considered as meeting the asset boundary (as a non-produced asset).
5. The three main considerations for the possible recognition of OPs as an asset are as follows:
 - There are explicit transactions related to accessing OPs.
 - To allow for the different intrinsic values of the OPs, associated with the information they contain, to be represented in the value of the data asset they are underpinning.
 - To properly reflect the real world value that firms seek in return for providing free service in return for (access to) OPs.
6. While a majority of OPs are accessed by firms without being an explicit monetary exchange, there are numerous examples where this is the case. Such a transaction would obviously need to be included in the accounts, as noted in the ISWGNA guidance note as well. It’s important to appreciate that this is not limited to traditional market research firms, where consumers would complete a questionnaire for money or a voucher. Modern examples include platforms such as “coinout”, in which the firm pays people a compensation in cash for uploading a purchase receipt to their platform. Amazon has recently provided a similar option (in exchange for future discounts from its site).⁴
7. A purchase of a good or service can be considered as an OP. Unless the action of the individual uploading the receipt of a purchase (an information element on the OP) is considered an act of production, an interpretation which appears to have very limited support, the platform is purchasing either a non-produced asset, or the right to access information on the OP. As evidenced by the fact that it’s obtained via a market transaction, this information on purchase receipts, when explicitly transacted, has a certain value.⁵

⁴ See <https://panel.amazon.com/> and <https://www.coinout.com/>

⁵ Importantly, the information from the very same observable phenomenon, which was given a value due to the explicit transaction taking place is still available to the seller. Conceptually, the value of having access to this OP

8. The second reason for insisting that an OP has an intrinsic value is that part of the value of the data asset seems to derive from the information embedded in it. Not recognizing this intrinsic value of the OPs may lead to an overestimation of the value of the produced part (depending on the valuation method), possibly also affecting important macroeconomic indicators such as GDP and GNI. Acknowledging the intrinsic value of OPs keeps the door open to distinguish the data asset into a produced and a non-produced part. The merits and shortcomings of looking upon a data asset as consisting of a produced component and a non-produced one are debated later in the paper.
9. Recently, it was estimated that after removing the value of cash, physical and intangible assets, and accumulated research and development from the market value of Alphabet, nearly 1.4 trn \$USD worth of value was unaccounted for (The Economist, 2020). While this unaccounted value may be caused by a variety of factors (market sentiment, business and legislative environment, rent seeking due to monopolistic behaviour, etc.), a large portion of this value may indeed relate to the net present value assigned to the data asset held by Alphabet. Even if 50% of the value would be unrelated to the value of data, assigning no value to the OPs underpinning this, and considering none of the data asset as being non-produced, national accountants would be faced with two options: to include the single most expensive fixed asset in history, or to ignore the full value of this asset from the corporation's balance sheet.
10. Finally, while there appears a general consensus that no transactions should be imputed in the core accounts relating to the production and consumption of free digital services (for a variety of reasons⁶) and that these values should only be included in a satellite account⁷, it appears clear that the real world behaviour by firms in making significant efforts to obtain (access to) OPs reflects the fact that they represent a certain value.
11. Overall, for the above reasons, in our opinion, the statement that the value of an OP is “*virtually zero*” or that “*a single observable phenomena does not meet the definition of an asset*” needs further consideration, and any decision to exclude them from balance sheets in the core accounts may need to be looked upon as a pragmatic choice, rather than a conceptual one. The viewpoint should, however, not be interpreted as implying an appetite for including every OP on the balance sheet. There appears little desire to see balance sheets swamped with imputations for OPs, regardless of whether a monetary transaction has occurred.⁸ Therefore, for the reasons listed above, **it is recommended that an observable phenomenon is considered capable of generating value and therefore have asset like qualities, but that any recording is limited to transactions, and only when an explicit monetary transaction occurs that results in access to an observable phenomenon.**⁹ It will depend on the specific recording how this would materialize in the accounts.

and the intrinsic information it contains should be considered when valuing any data created as a by-product of the conventional production process.

⁶ The main reasons for their exclusion is the question whether a true (market) transaction is actually taking place; the problems in applying an appropriate value to the exchange; and the fear of large imputations swamping the core accounts.

⁷ A view shared by the authors of this note.

⁸ Additionally it needs to be borne in mind that the value comes from the information contained in the OP rather than the OP actually occurring.

⁹ The exact classification of this transaction is discussed below, but a rent payment recorded in the income account appears the most likely/appropriate option.

As mentioned, it could be in the form of recognizing the purchase of a non-produced asset or remuneration for the right to access observable phenomena, which could be recorded as a rent.¹⁰ This will be further discussed in Section 5.

12. At this point, the requested information associated with the non-produced observable phenomena is obtained/collected/recorded thereby becoming data and recorded on the balance sheet of the firm as data.¹¹ This secondary recording is important as it is also recommended **that OP, despite their asset characteristics and their ability to generate value, should not be recorded as an asset on either the balance sheet of the sector where the observable phenomenon takes place or the sector accessing and subsequently recording information associated with the OP.** This decision to exclude them, in their basic form, from the accounts is driven by reasons of practicality.¹²
13. Overall, this recommendation may seem a pedantic change from the current proposal, after all the end result (no recording of OPs on balance sheets) is the same. However, the inconsistencies and externalities just raised contain quite serious concerns, which could be reduced if rather than assuming OPs have no value, they are considered to have a value (no matter how small) and exhibit the characteristics of non-produced assets, but for practical reasons are excluded from the core accounts.

Section 3. Three basic models for acquiring observable phenomena

14. Access to observable phenomena (OPs) can be obtained in different ways. While a combination of capital and labour will always be needed to create a data asset, the critical third ingredient, access to the OPs, which fundamentally underpin the data product can be sourced using a variety of methods.
15. One can distinguish three basic ways in which firms acquire (access to) OPs:
 - in exchange for free services;
 - by explicitly purchasing them;
 - as a by-product of the primary production process.
16. Firms may provide services ‘for free’ (or at very low prices) in order to get access to OPs from users. These services include the well-known social media platforms, search engines, as well as free applications providing specific services (budgeting, fitness, simple entertainment, etc.). The free services are typically provided by the same firm who will subsequently obtain the access to the OPs. The cost of providing these services for free or at very low cost is referred to in this paper as *OP procurement costs*. Depending on the measurement approach, these costs could be recorded as fixed capital investments into the data asset (i.e., considered as being produced); looked upon as representing the intrinsic value of the OPs (i.e., contributing to the non-produced

¹⁰ The privacy of the households providing the receipts can then be considered as a non-produced non-financial asset similar to natural resources. However, please note that this is not recorded on the balance sheet and that it is also not advocated to do so.

¹¹ This data asset may be either produced or non-produced, see section 5.

¹² Such a decision contradicts an example presented below whereby access to an OP is sold as a non-financial, non-produced asset, such a treatment would necessitate the explicit recording of an asset.

component of the data asset) or continued to be treated as simple current expenditure, a treatment likely practiced currently.

17. Examples of firms explicitly purchasing OPs include firms paying for information collected by e.g. consumer questionnaires on preferences, experiences and satisfaction. In this scenario, firms are usually obtaining access to OPs that contain rather specific information. They may not be easily obtainable, either publically or in exchange for providing a free service, hence the reason why specialised firms explicitly pay households for providing them with (access to) the OPs. The amount remunerated to the supplier of the OP is a market transaction, priced so that it creates enough supply of OPs from households while still maintaining profitability for the firms.
18. Finally, OPs may often be generated as an externality of a firm's primary production process. These OPs are typically obtained for no cost, and used to improve the efficiency of the internal operations or to detect behavioural pattern of clients to increase revenue. Dynamically generated recommendations on a retailer website is an obvious outward facing example for the consumer. Other examples concern pulling together internally generated data to increase the efficiency of production, such as optimising supply chains for manufacturers, and detecting fraudulent activity for financial service providers. While these firms may likely have some (additional) expenditures to record, organise and analyse the OPs (referred to in this paper as *recording and processing costs*), the firms usually do not spend money on obtaining access to OPs in the first place, unlike the previous two methods.
19. These different methods are important for the conceptual discussion on how to look upon the data asset. While it is generally accepted that *recording and processing costs* involved in creating a data product would be considered as contributing to a produced asset, there is less clarity regarding the treatment of the additional costs of procuring the OPs. One could argue that this is contributing to the produced part of the data asset; or alternatively, one could look upon this as adding to a separate, non-produced, component. In answering this question, it is important to bear in mind that the activity undertaken to procure the OPs may also be contributing to the production of other output of the firm (e.g. a platform may be used to obtain OPs but also for advertising). Therefore, if the OP procurement costs are to be regarded as contributing to the data asset, it may not be as simple as yes or no, but it should also be assessed how they are contributing and to what extent.
20. Furthermore, in recognizing the procurement cost as adding to the data asset, another issue may arise in how to maintain consistency in the recording and valuation of data assets according to the three different ways to obtain data, bearing in mind that not every OP may involve procurement costs to obtain access. In this regard, it is also important to look at the sustainability of the proposed recording and valuation over time. "*There will always be a version of Facebook that is free*". This quote from Facebook CEO, Mark Zuckerberg's testimony to the US congress perhaps offers an insight into possible changes that may one day occur across the industry based on the provision of free digital services.¹³ Just as it is critical that any decision on how to value and classify components of the data value chain, including the OPs that underpin it, allows for a consistent

¹³ This quote implicitly left open the option of a paid version, which may run concurrently with the free version. <https://techcrunch.com/2018/04/10/mark-zuckerberg-there-will-always-be-a-version-of-facebook-that-is-free/>. A model that appears to have now instigated by twitter recently. While most people speculated that a paid version may be in exchange for removing adds, it may also be in exchange for not collecting information on the user.

treatment of OP and data, any final decision must also remain valid if business models start to change in the future. While currently the vast majority of OPs are obtained without an explicit payment (or payment in kind), there is the possibility that many firms currently providing free digital services move to freemium-like pricing model, thereby potentially shifting a firm from one conceptual model to another.

Section 4. Valuation methods

21. Leaving aside any question on the conceptual treatment of OPs and data, a fundamental question remains on how to value data assets (and their creation) in the absence of regular market transactions. Two options recommended in the SNA include calculating estimates of GFCF based on the sum-of-costs of production, or on the basis of the net present value (NPV) of the asset.
22. The sum-of-costs approach is well known to statistical offices as it is often used for own account or non-market GFCF. Arguably, a clear advantage exists in advocating for a sum-of-cost approach due to the similarity between the measurement of data and other intangible fixed assets for which the sum of cost approach is often used. The produced component might simply be considered as equal to staff time and capital services of assets used in *recording, organising and storing information on observable phenomena in a digital format* as well as the costs of items used as intermediate consumption. As will be discussed in the examples, this staff time, capital services and intermediate consumption may or may not extend to those costs incurred during the procurement of the OPs.
23. The NPV is based on potential future earning that may be derived from the asset; again, this is already in use in some areas of the national accounts, for example when valuing natural resources. However, since data can have so many context-dependent uses, including the possibility of the same data being used multiple times, the potential revenue stream is limitless. Additionally, in the case of a natural resource, the stock of the resource, its use, the pattern of use, the price and the amount of time until the known stock is depleted are broadly understood. In the case of data, with the industry in such infancy, a lot of this information is unknown. If asset values and the GFCF undertaken to produce them were measured based on future earnings, the valuation could bring in additional unrelated external effects such as potential monopolistic network effects, rent seeking due to market power and contributions from other unknown capital. Inclusions such as these on such a grand scale would likely have severe negative impacts on important macro-economic indicators.
24. While generally both approaches can be applied to derive a value for the full data asset, some issues may arise if one aims to distinguish between a produced and a non-produced component. This issue also opens up some questions about the comparability of the results according to these approaches when applied to the three different ways to obtain access to OPs. In this regard, in addition to deciding which costs to consider for the produced and the non-produced part in applying the sum-of-costs approach, it may also create an issue that the procurement of OPs may not always involve explicit costs. This means that it will not be feasible to derive a value for this part of the data asset in the scenario that OPs are accessed for free, when applying the sum-of-costs approach. This will become particularly apparent if this part is recorded as the non-produced component of the data asset, but it also implies lack of comparability when it would be regarded as part of the produced component.

25. For the NPV approach, the main challenge will be to assign relevant amounts to the produced and non-produced component. Assumptions will be needed to make this split, probably relying on the sum-of-cost approach to derive the value of either one of the components, and derive the remaining component as residual. An important consideration in this regard is the potential for significant values entering the production boundary when deriving the produced part as the residual. As previously outlined in Section 2, market valuations of data based businesses (which theoretically are based on future earning potential) may be significant.
26. It's important to note a clear difference between the two methods when it comes to incorporating a non-produced component into the data asset. Since the sum-of-costs approach is limited to observed values, the value of the non-produced portion is limited to being directly equal to the value assigned to the OPs (valued as the cost of obtaining access to them). This is not the case for NPV, where the non-produced component is likely to be the "unknown" value, calculated residually once the value of the produced portion is removed from the total value. This could result in a non-produced value significantly higher (or much lower) than the cost incurred in obtaining the OPs. Since both valuation approaches have their advantages and disadvantages, it was considered relevant to incorporate both approaches into the examples provided in Section 5.

Section 5. Three scenarios on how different business models generate data assets

27. This section presents three scenarios for the creation of a data asset, in line with the various modalities to acquire access to OPs, as described in Section 3. For each of the three scenarios, the possibilities to account for the creation of the data asset are explored, numerical examples are provided, including an assessment of how the different ways of recording and measurement affect aggregate national accounts indicators, such as output, gross value added (GVA), gross fixed capital formation (GFCF), capital stock, net worth, etc. The various approaches for recording the creation of the data asset depend on two interrelated choices. Firstly, whether the data asset is considered entirely produced or a combination of produced and non-produced. Secondly, whether the value of the resulting asset is derived using a sum of cost approach or using an NPV approach. A detailed description of the scenarios is available in an accompanying excel file. This paper highlights the main outcomes.
28. The section introduces three firms, i.e. **PVDV** holdings, **JML & Co**, **JZB Pty. Ltd**, that each link to one of the three ways to obtain access to OPs:

Firm	Method of obtaining access to OPs
PVDV holdings	In exchange for free service
JML & Co	Generated as a by-product of production
JZB Pty. Ltd.	Explicitly purchased

29. For each firm, there are many different ways of how the creation of the data asset might be recorded:
- The basic scenario (example 0 in the spreadsheet, not explicitly outlined in the paper) follows the current 2008 SNA treatment.
 - Scenario 1 shows the results using the sum-of-costs approach.
 - Scenario 2 shows the results using the NPV approach.

30. For the two new scenarios, there are additional variants (1a-d and 2a-d), showcasing the differences in treatment depending on additional choices faced by compilers, regarding:
- if the asset is considered entirely produced (1a,1d & 2a) or a mixture of produced and non-produced (1b, 1c & 2b-d).
 - if all costs are included in deriving the value of the produced component (1d & 2a, 2c), or just the *recording and processing costs* (1a & 2b).
 - If, for those compiled using the NPV method, the non-produced component is derived residually (2b, 2c) or based on the value of the OPs according to the sum-of-costs approach (2d).
31. To clearly understand the options available, there is an important distinction regarding the expenditures firms make in order to generate a data asset. This distinction splits the costs involved into two categories and can be explained using a revised definition of data provided based on that provided in the draft ISWGNA guidance note. The updated definition defines data as *“Data is information content that is produced by accessing and observing phenomena; and recording, organizing and storing information elements from these phenomena in a digital format, which can be accessed electronically for reference or processing”*.¹⁴
- The first category of costs includes those incurred for recording, organising, storing and processing elements of OPs in order to generate the information content. For the purpose of these examples, this category will be referred to as **recording and processing costs (R & P cost)**.
 - The second category includes costs incurred in accessing the OPs from which to derive specific information. For the purpose of these examples, these costs will be referred to as **OP procurement costs (OP P cost)**.
32. The above distinction is quite critical for the discussion, as there appears consensus that the first component, the recording and processing costs, should always be considered as an act of production. This makes perfect sense, as these expenditures have the basic characteristics of production, i.e. requiring the input of labour and capital in order to actually produce a data asset. The second component, however, could be considered as an additional cost, spent to overcome the problem that, for many firms, the amount of OPs available at no cost may be insufficient in either quantity or quality.
33. Therefore, a key point in this discussion is whether the additional costs for getting access to OPs should be considered as a part of the overall production process, thereby included in the produced component of the data asset being created. Alternatively, should they be considered as costs involved in order to improve the quantity and/or the quality of the OPs obtained, and thus allow for a more valuable data asset. In that case, the additional value is not due to additional production but simply the result of the firm having at its disposal more, or higher quality, OPs.

¹⁴ The current definition in the preliminary guidance note is actually *“information content that is produced by collecting, recording, organising and storing observable phenomena in a digital format, which can be accessed electronically for reference or processing”*. This paper suggests to replace collect with access and obtain, due to the likely crossover between recording and collecting, additionally the updated definition explicitly outlines that it is the information from the OP that is organised, recorded and stored, rather than the OP itself which may not be possible.

Example 1: PVDV holdings

34. PVDV holdings creates revenue through advertising on its search platform. For this purpose, the company created an algorithm-based search platform in T-1, which was recorded as GFCF (software) in year T-1. At the end of T-1, the software asset is valued at 90, while COFC is 30 a year.¹⁵ During year T-1, PVDV employed two people, each paid 30 a year. One person is managing the advertising business end-to-end, recruiting clients, designing the advertising, etc. The other person is employed exclusively to maintain the software asset (half of this cost will be considered an OP-P cost, while the other half is considered as contributing to the production of advertising services). The only intermediate consumption for PVDV is electricity at 30 a year. For accounting purposes, this amount is apportioned: 10 per year is considered as input to produce the advertising services, while 20 a year is needed to run the software (OP-P cost). At the end of year T-1, PVDV has 50 in cash and no liabilities. All profits are allocated to net worth, nothing is distributed.
35. During year T, PVDV holdings decides to obtain, record, organise, and store observable phenomena (OPs) related to the searches used on the platform. With this information, a data asset is created to improve the effectiveness of the advertising services, thereby maximising revenue. In order to build the new data asset, PVDV hires one more person used exclusively to build the data asset (COE of 30 a year (R & P cost)). Moreover, additional electricity of 15 a year is required to build the data asset in year T (R & P cost). The employee and the additional electricity are maintained in T+1, at the same cost, and continue to collect and manage the observations into the data asset. In year T-1 and year T, revenue from advertising for PVDV holdings was 200. However, in T+1, PVDV holdings puts the data asset to work which results in an increase of revenue to 250. Wages and intermediate consumption remain the same. A summary of the main information for the three years is provided below.

PVDV	T – 1	T	T + 1
Advertising revenue	200	200	250
Total COE	60	90	90
Intermediate consumption	30	45	45
Software asset (end year)	90	60	30
COFC per year	30	30	30

36. The new data asset could be valued in three ways: (i) **the sum of recording and processing costs only**; (ii) **the sum of both recording and processing, and OP procurement costs**; or (iii) calculated using the **net present value of the data asset**.

¹⁵ For simplicity, in all examples, it is assumed that assets have a service life of three years, with consumption of fixed capital (COFC) estimated using a simple linear depreciation (i.e. annual COFC will equal one third of the initial value of the asset).

- The **sum of the recording and processing costs only** (*example 1a in PVDV sheet*) would include the additional intermediate expenditure and wages associated with building the data asset. This would value the data asset at 45:

Recording and processing costs of data asset	45
Intermediate consumption	15
Compensation of employees	30

- The **sum of both recording and processing, and OP procurement costs** would include the above recording and processing costs as well as a proportion of the costs associated with providing the free services that procure the OPs (the OP-P cost), i.e. the costs related to operating the software. For reasons of simplicity, 50% of the latter costs is assigned to the provision of the free services, while the other 50% is assigned to producing the advertising services. The business model of PVDV suggests that spending additional resources in order to generate more OPs will lead to a better, more effective (a.k.a more productive/valuable) data asset. These OP procurement costs can either be added on top of the recording and processing costs, and be treated as GFCF, if the data asset is considered 100% produced (*example 1d in PVDV sheet*), or these can be regarded as representing the non-produced component of the data asset (*example 1b in PVDV sheet*). In both cases, the value of the data asset would be equal to 88 (i.e. recording and processing costs of 45 (see above) and OP procurement costs of 43 (see below)), in the former case regarded as being fully produced and in the latter case consisting of a produced part (45) and a non-produced part (43).

OP procurement costs of data asset	43
1/2 intermediate consumption of running software	10
1/2 compensation of employees for running software	15
1/2 COFC of software asset	15
1/2 net return to capital asset (6% of 90)	3

- Finally, the value of the data asset could be estimated by calculating the **net present value of the data asset** based on future increases in profit. For reasons of simplicity, it is assumed that due to the new asset, profit increases by 50 each year for the next three years. Using a discount rate of 6% and a three year period for the generation of the additional profits, results in a value of 134 (see below). This can be considered as entirely produced (*example 2a in PVDV sheet*). Alternatively, a breakup of the value into a produced and non-produced part can be achieved using either the recording and processing costs only to represent the produced component and the residual as the non-produced (*example 2b in PVDV sheet*); using both the recording and processing costs and the OP procurement costs to represent the value of the produced component with the non-produced left as the residual (*example 2c in PVDV sheet*); or fixing the non-produced component to the value of the OP procurement costs and the produced as the residual (*example 2d in PVDV sheet*).

PVDV	T + 1	T + 2	T + 3	Total value
Additional profit	50	50	50	
Discount rate	1.06	1.06	1.06	
Additional value	47.2	44.5	42.0	134

Example 2: JML & Co

37. JML & Co runs a successful (but small) retail firm. They derive revenue of 200 in year T by selling products to the household sector. They have two employees (COE of 30 a year each) and use only electricity (10 a year) to produce the output.
38. In year T, the firm begins to record, organise, and store OPs related to the value and timing of their sales in order to improve their efficiency. They hire a new employee (COE of 30 a year) to record the OPs and organise them into a data asset (R & P cost). This additional activity also requires more electricity (15 a year (R & P cost)). A summary of the inputs and outputs from production is presented below. At the end of year T-1, JML & Co has 50 in cash and no liabilities. Profits are not distributed, and added to net worth. The additional information that the database provides allows them to increase revenue to 250 in T+1, while maintaining the current number of employees and the same electricity usage.

JML	T - 1	T	T + 1
Revenue	200	200	250
Total COE	60	90	90
Intermediate consumption	10	25	25

39. JML & CO could value the new asset in two ways, using either the **sum of recording and processing costs** or the **net present value** of the asset. Since there are no OP procurement costs associated with generating the OPs or market transactions for acquiring them, it is not possible to calculate a value using the sum of recording and processing and OP procurement costs similar to the other two business models.

- A value based on the **sum of recording and processing costs** associated with the production of the data asset would equal 45 and include the intermediate consumption (15) + COE (30) associated with production of the new asset (*example 1a in JML sheet*).

Recording and processing costs of data asset	45
Intermediate consumption	15
Compensation of employees	30

- Alternatively, the value of the data asset could be based on the **net present value**, assuming for reasons of simplicity that profits increase by 50 each year for the next three years, thus arriving at a value of 134 for the data asset. This NPV scenario is consistent across all three business model scenarios. In this case, there are two alternatives for recording. Firstly, one could consider the full amount as the result of production (*example 2a in JML sheet*). Alternatively, a breakup of the value into a produced and non-produced part can be achieved using the recording and processing costs to represent the produced component and the residual as the non-produced component (*example 2b in JML sheet*).

JML & Co	T + 1	T + 2	T + 3	Total value
Additional profit	50	50	50	
Discount rate	1.06	1.06	1.06	
Additional value	47.2	44.5	42.0	

Example 3: JZB Pty Ltd

40. JZB Pty Ltd. is a consultancy firm that provides information on the real time spending characteristics of households. JZB Pty Ltd. does this by encouraging people to provide copies of their purchase receipts. JZB obtains, records, organises, and digitally stores these receipts to determine real time spending patterns and then uses the information to provide consulting services to third parties. To produce and sell their consulting product, JZB Pty Ltd. employs two people (COE of 30 a year each) with one additional person (COE of 30 a year) employed exclusively to obtain, record, organise and store the observations (receipts) (R & P cost). The only other intermediate consumption is electricity of 25 per year, broken down into 10 for ongoing business, and 15 for obtaining and analysing the observations (R & P cost). JZB Pty Ltd. has been doing this for several years with an existing data asset valued at 75 at the end of year T – 1. This asset depreciates by 25 each year. At the end of year T-1, JZB Pty Ltd. has 50 in cash and no liabilities, while profits are not distributed, and added to net worth.
41. To increase the amount of information they have, beginning in year T, JZB Pty. Ltd. starts to offer people small monetary payments in return for copies of their receipts. Overall, JZB Pty. Ltd. pays a total of 50 a year directly to the various households in exchange for letting JZB obtain the information on their receipts (OP-P cost). This greatly increases the amount of OPs that JZB Pty. Ltd. can access leading to more accurate information on spending patterns resulting in higher revenue in year T + 1.

JZB	End of T – 1	End of T	End of T + 1
Consulting revenue per year	200	200	250
Total COE	90	90	90
Intermediate consumption	25	25	25
Payment direct to households	0	50	50
existing data asset	75	?	?
COFC per year	25	25	25 + COFC from new GFCF amount

42. JZB could value their data asset in three ways; (i) **the sum of recording and processing costs only**, (ii) **the sum of both recording and processing, and the OP procurement costs**, or (iii) **the net present value of future returns from the data asset**. In addition, a choice is required on how the payment in exchange for the receipts is classified.

- The payments for receipts could be classified as an allowance for accessing the OPs of the household, and thus as a kind of **rent payment** to households. In this scenario, the privacy of the households providing the receipts is considered a non-produced non-financial asset similar to natural resources.¹⁶ The payment of rent would be recorded as rent in the primary income account, i.e. not as intermediate consumption. Usually, when calculating the sum of cost for own account GFCF, expenditure within the primary income account would not be considered for inclusion, thus applying a standard sum-of-costs approach would imply deriving the value of the asset on the basis of the **sum of recording and processing costs only** (*example 1a in JZB sheet*).

Recording and processing costs of data asset (excluding payment for observations)	45
Intermediate consumption	15
Compensation of employees	30

- However, an alternative is to also regard the additional rent payment as adding to the overall value of the produced component of the data asset.¹⁷ In this case, the value of the produced component would be considered equal to both **the sum of recording and processing and the OP procurement costs (the explicit payment to households)** (*example 1d in JZB sheet*).

Recording and processing costs of data asset including payment for observations	95
Intermediate consumption	15
Compensation of employees	30
Payment made to households providing receipts	50

- Alternatively, a non-produced component could be included with a non-produced asset equal to the OP procurement costs being added to the firm's balance sheet. This limits the value of the produced data asset to just the recording and processing costs. The payment for the OPs could still be classified as rent (similar to example 1a and 1d), this would require an OCV to be recorded equal to the rent payment (*example 1c in JZB sheet*). Alternatively, the payment could be considered **a purchase of a non-produced asset**, with the purchase amount being included in the balance sheet, (*example 1b in JZB sheet*).
- In addition to the above recording option, a value for the asset could be estimated by calculating the **net present value** of the additional profits (as done in the previous examples). This asset could then be considered entirely the result of production (*example 2a in JZB sheet*), in which case the payment in exchange for the receipts is recorded as a rent payment in line

¹⁶ A decision would need to be made whether it is practical to record an OCV (and subsequent balance sheet item) on the household side to represent the non-produced asset that the firm is accessing. This would require a valuation method (which could be linked to the value of the rent payment). However, for pragmatic reasons it is recommended to not include the value of these non-produced assets in the accounts for the household sector (see section 2). Similarly, there appears universal support that OPs are not considered as produced, explaining why the payment has not been considered as output (of households) and intermediate consumption (of the company purchasing the OPs).

¹⁷ Such a conceptual change would need to be made with a consideration on its impact on the value other asset classes calculated as sum-of-costs.

with one of the previous options. Alternatively, the asset could be split between a produced and non-produced part with either just the recording and processing cost counted as produced, thereby deriving the value of the non-produced part residually (*example 2b in JZB sheet*); including both the recording and processing and the OP procurement costs as produced leaving the residual as non-produced (*example 2c in JZB sheet*); or setting the non-produced component as equal to the OP procurement costs, with the produced component derived residually (*example 2d in JZB sheet*).

JZB Pty Ltd.	T + 1	T + 2	T + 3	Total value
Additional profit	50	50	50	
discount rate	1.06	1.06	1.06	
additional value	47.2	44.5	42.0	

Section 6. Summarising the impact of the different examples and scenarios.

43. This section discusses the impact of the different recording options, on the basis of the three examples presented in the Section 5. Since these are purely numerical examples, it is important not to pay too much attention to the absolute values, but to focus on the differences between the options. Rather than providing any reasons for or against a certain approach, this section solely focuses on the impact that different classification decisions have on various aggregate indicators.
44. In the previous section, the scenarios displayed three ways via which firms can obtain access to OPs: (i) providing free services in exchange for access to OPs (PVDV); (ii) generating OPs as a by-product of the standard production process (JML); and (iii) explicitly purchasing OPs (or access to OPs) (JZB). In all three scenarios, the accounting and classification options can alter the impact that the transactions and positions have on the aggregate indicators. The analysis of this impact is not limited to GDP, but also includes other important indicators, such as GFCF and the level of produced and non-produced assets, which may be relevant for e.g. productivity estimates. Furthermore, there may also be an impact on how (implicit and/or explicit) transactions between sectors are recorded in the accounts.
45. As discussed in Section 4, the valuation can either be done on the basis of a “sum-of-costs” approach, or be based on the “Net Present Value” (NPV) of the asset. To highlight the differences between these two approaches, examples 1a-d show results on the basis of the sum of cost method and 2a-d on the basis of the NPV method.
46. While all three firms obtain their OPs in different manners, the scenarios of PVDV and JZB have some similarities, as they are both required to, or choose to, pay additional costs to obtain access to more, or higher quality OPs, in order to improve their data asset. These costs are on top of the recording and processing costs paid to create the data asset. In the case of PVDV, these additional OP procurement costs relate to the costs of providing services for free to the household sector. In the case of JZB, the OP procurement costs consist of the explicit payments to the household sector in return for access to their OPs. JML does not have any additional expenditure in this regard. As explained later, the latter limits the possible ways that the OPs can be recorded for JML.
47. Due to the similarities between the PVDV and JZB examples, this section first shows how the different recording options affect the results on the basis of the sum-of-costs approach using the

PVDV scenario. It will then show the differences between the recording options when using the NPV approach, focusing on the JZB scenario. The final portion of the section will focus on the JML scenario to explain how the results would differ, if no additional OP procurement costs can be distinguished.

Applying the sum-of-costs approach

48. In all three sum of cost examples, the recording and processing costs of creating the data asset (45) is capitalised, which would result in a minimum increase for GFCF each year of at least 45, compared to the current SNA treatment, regardless of the option chosen. The main question then becomes how the additional OP procurement costs (43) are accounted for.
49. In *example 1a*, the recording and processing costs are the only expenditure contributing to the data asset. The OP procurement costs (43) paid to obtain the OPs are recorded as current costs (i.e. compensation of employees and intermediate consumption). As a consequence, GVA and GFCF, and the stock of produced assets all end up 45 higher (the value of the data asset) than under the current 2008 SNA.

Example 1a. Sum-of-costs approach - recording and processing costs as GFCF (PVDV)

	Year T-1	Year T	Year T + 1
GVA	-	200	250
GFCF	-	45	45
COFC of produced assets	-	-30	-45
OCV-Emergence of non-produced assets	-	0	0
OCV-Depletion of non-produced assets	-	0	0
	End Year T-1	End Year T	End Year T + 1
Stock of Produced assets	90	105	105
Stock of non-produced assets	0	0	0
Financial assets	50	115	230
Net worth	140	220	335

50. In *example 1b*, GVA in year T+1 is also 250, similar to example 1a, as the OP procurement costs (43) still do not add to GFCF, but unlike example 1a, through the provision of free services, the firm is deemed to have “acquired” an additional asset, which are valued at the costs of providing the free services. This is recorded in the other changes in the volume of assets (OCV) account, as an emergence of a non-produced asset. Because of this, while GVA and the stock of produced assets is the same in examples 1a and 1b, the balance sheets will differ and the overall net worth will be higher in example 1b, due to the additional value of the non-produced asset (see yellow cells). Furthermore, the appearance of the non-produced asset will also lead to the recording of depletion in the following years (see green cell), also affecting net worth.

Example 1b. Sum-of-costs approach - recording and processing costs as GFCF; OP procurement costs as non-produced asset (PVDV)

	Year T-1	Year T	Year T + 1
GVA	-	200	250
GFCF	-	45	45
COFC of produced assets	-	-30	-45
OCV-Emergence of non-produced assets	-	43	43
OCV-Depletion of non-produced assets	-	0	-15
	End Year T-1	End Year T	End Year T + 1
Stock of Produced assets	90	105	105
Stock of non-produced assets	0	43	71
Financial assets	50	115	230
Net worth	140	263	406

51. In *example 1d*, the OP procurement costs are included in the sum-of-costs for valuing the produced data asset. This not only increases the level of GVA compared to examples 1a and 1b, but also increases the overall stock of produced assets (see orange cells). Please note that net worth is the same as in example 1b (highlighted in red), because overall assets of the same value are still owned by the firm, only the composition of the assets (non-produced versus produced) differs. Furthermore, the additional GFCF will result in more produced assets leading to the recording of additional COFC in the following years (see light blue cell).

Example 1d. Sum-of-costs approach: recording and processing costs and OP procurement costs as GFCF (PVDV)

	Year t-1	Year T	Year T + 1
GVA	-	243	293
GFCF	-	88	88
COFC of produced assets	-	-30	-60
OCV-Emergence of non-produced assets	-	0	0
OCV-Depletion of non-produced assets	-	0	0
	End Year T-1	End Year T	End Year T + 1
Stock of Produced assets	90	148	176
Stock of non-produced assets	0	0	0
Financial assets	50	115	230
Net worth	140	263	406

52. The results for JZB would be more or less similar to the above examples, except that the OP procurement costs of 43 used in the PVDV example, representing the costs of obtaining the OPs, would be replaced with OP procurement costs of 50 for JZB, representing the explicit payment to households for obtaining their OPs. While this would lead to slightly different amounts for the main indicators compared to the ones presented above, the premise is the same, in that the OP procurement costs can either be ignored in estimating the asset (option 1a)¹⁸, used to value the

¹⁸ By “ignored”, it refers to the fact that the value is not included towards the sum-of-costs value of the produced or non-produced asset. Obviously, the transaction would still need to be recorded in the suite of accounts as an actual transaction

non-produced component (option 1b (& option 1c for JZB), or added to the sum of cost of the produced asset (option 1d).

Applying the NPV Approach

53. In *example 2a*, the entire value of the data asset is considered the result of production. In applying the NPV approach, this means that the entire value (134) would contribute to GFCF. Of course, in the case of JZB, the payment of 50 made to the household sector would still have to be recorded, as an explicit transaction has occurred. In this example, this payment has been recorded as a rent payment in the income account, paid in exchange for the right to access the non-produced asset (privacy) held by the household sector. This payment lowers the cash balance of JZB, but is offset by the additional net operating surplus resulting from the additional output related to the creation of the data asset, which is fully recorded as GFCF.

Example 2a. Value using NPV approach, entire data asset as produced (JZB)

	Year T-1	Year T	Year T + 1
GVA	-	309	359
GFCF	-	134	134
COFC of produced assets	-	-25	-70
OCV-Emergence of non-produced assets	-	0	0
OCV-Depletion of non-produced assets	-	0	0
	End Year T-1	End Year T	End Year T + 1
Stock of Produced assets	75	184	248
Stock of non-produced assets	0	0	0
Financial assets	0	85	170
Net worth	125	269	418

54. In order to alleviate concerns that the advent of NPV based valuations may cause significant interference with estimates of GDP, a more prudent method might involve to only treat the recording and processing costs (45) as GFCF, thereby considering the residual value of the asset as being non-produced. This is shown in *example 2b*. In this case, there is no need for a rent payment, rather the explicit payment would be considered as a purchase of a non-produced asset and recorded as such in the capital account.¹⁹ Since this transaction only accounts for 50, while the produced part accounts for 45, a remaining amount of 39 (= 134 – 45 – 50) still needs to be recorded. In example 2b this is recorded as an OCV.²⁰ This combination of GFCF, the purchase of non-produced assets (see green cells) and OCV (see orange cells), would result in the same level of net worth but would lead to lower values of GVA and GFCF, as well as of the stock of produced

has taken place. For PVDV this would add to the level of current costs, while for JZB it would be shown as a rent payment in the income accounts.

¹⁹ In this situation, an OCV event, creating the non-produced asset, would occur in the household sector just prior to the purchase occurring.

²⁰ The choice of recording this amount as an OCV instead of a revaluation is due to the OP being purchased for 50 not being considered as identical to those that are then contained in the data asset. Revaluations should only be considered when the exact same asset is valued higher or lower than previously.

assets and related COFC in the following year (see yellow cells). On the other hand, it would lead to higher values of acquisition of non-produced assets, OCV and stocks of non-produced assets (and related depletion) in the following year (see orange cells).

Example 2b. Value using NPV: recording and processing costs as GFCF, non-produced equals residual

	Year T-1	Year T	Year T + 1
GVA	-	220	270
GFCF	-	45	45
COFC of produced assets	-	-25	-40
Purchase of non-produced assets	-	50	50
OCV-Emergence of non-produced assets	-	39	39
OCV-Depletion of non-produced assets	-	0	-30
	End Year T-1	End Year T	End Year T + 1
Stock of Produced assets	75	95	100
Stock of non-produced assets	0	89	148
Financial assets	0	85	170
Net worth	125	269	418

55. An approach that might also be considered more prudent than 2a, but still reflective of the human input needed to obtain the OPs used for generating the data asset, would be to limit the level of GFCF to the recording and processing costs of creating the asset (45) plus the amount paid directly to the household in exchange for accessing the OPs (50). This is done in *example 2c*. While the value of the explicit payment is used to derive the value of the produced asset, JZB is not buying a produced asset from the household sector, which would otherwise result in the OPs themselves being considered produced (by the household sector). Therefore, a rent payment is made, similar to the recording in example 2a, but the value of this rent payment is used to determine the value of GFCF. Since the overall value of the asset has already been determined based on its NPV, the difference between on the one hand the NPV amount (134), and on the other hand the sum of the recording and processing cost (45) and the OP procurement costs (50) would be considered the non-produced component. In comparison with example 2b, this method would lead to higher values of GVA and GFCF, stocks of produced assets, as well as to higher COFC in the following year (see green cells). On the other hand, there would be no recording of the acquisition of non-produced assets, leading to a lower stock of non-produced assets and depletion in the following year (see light blue cells). The emergence of non-produced assets in the form of OCV is the same as that in the previous example, i.e. the difference between the NPV and the sum of the expenditures involved in creating and obtaining the OPs for the dataset. Also, net worth will remain unaffected.

Example 2c. Value using NPV: recording and processing, and OP procurement costs as GFCF, non-produced equals residual

	Year T – 1	Year T	Year T + 1
GVA	-	270	320
GFCF	-	95	95
COFC of produced assets	-	-25	-57
OCV-Emergence of non-produced assets	-	39	39
OCV-Depletion of non-produced assets	-	0	-13
	End Year T-1	End Year T	End Year T + 1
Stock of Produced assets	75	145	187
Stock of non-produced assets	0	39	61
Financial assets	0	85	170
Net worth	125	269	418

56. An alternative to this approach and one that would at least value the OPs in line with their purchasers' price would be to calculate the produced component of the data asset as the residual, following the subtraction of the OP procurement costs (50) from the overall value of the data asset. This is done in *example 2d*. As with the other examples using the NPV valuation method, the combined stock of assets (produced and non-produced) and net worth is the same, but compared to example 2c, the level of GVA, GFCF, COFC and stocks of produced assets is lower (see yellow cells) and offset by higher acquisitions of non-produced asset and stocks of non-produced assets (see green cells). By limiting the value of the non-produced component to the value of the acquisitions also removes the need for any recording in the OCV account (see orange cells).

Example 2d. Value using NPV: OP procurement costs equal to non-produced component, produced equals residual

	Year T – 1	Year T	Year T + 1
GVA	-	259	309
GFCF	-	84	84
COFC of produced assets	-	-25	-53
Purchase of non-produced assets	-	50	50
OCV-Emergence of non-produced assets	-	0	0
OCV-Depletion of non-produced assets	-	0	-17
	End Year T-1	End Year T	End Year T + 1
Stock of Produced assets	75	134	165
Stock of non-produced assets	0	50	83
Financial assets	0	85	170
Net worth	125	269	418

57. As shown, net worth is the same across all four examples using the NPV approach (483 for PVDV, and 418 for JZB). This is because in all cases the value of the new data asset is estimated using the NPV of future returns derived from the data asset. The result is the same, as either the non-produced component (in examples 2b and 2c), or the produced component (in example 2d) is

calculated residually. Consequently, the only difference between the PVDV and JZB examples is how the OP procurement costs are treated. For PVDV, the additional expenditure (the cost of running the search platform) would be treated as current costs, rather than a rent payment or a purchase of non-produced non-financial assets, as is the case for JZB.

The recording in the case of freely accessible OPs

58. For JML, the OPs are obtained as part of the standard production process.²¹ As a consequence, there are no OP procurement costs and, thus, there are less options available on how to value the new data asset. While a choice still needs to be made between valuing the data asset using the sum-of-costs or on the basis of the NPV method, the sum-of-costs option is limited to the value of the recording and processing costs only. This is shown in *example 1a*, where, similar to PVDV and JZB, the data asset is considered 100% produced, with a value equal to the cost of producing it (45).

Example 1a. Sum-of-costs approach - recording and processing costs as GFCF (JML)

	Year T-1	Year T	Year T + 1
GVA	-	220	270
GFCF	-	45	45
COFC of produced assets	-	0	-15
OCV-Emergence of non-produced assets	-	0	0
OCV-Depletion of non-produced assets	-	0	0
	End Year T-1	End Year T	End Year T + 1
Stock of Produced assets	0	45	75
Stock of non-produced assets	0	0	0
Financial assets	50	135	270
Net worth	50	180	345

59. Alternatively, one could derive the value of the data asset on the basis of the NPV approach, recording the full NPV-value as a result of production. This is done in *example 2a* for JML. It would lead to higher GVA, GFCF, stocks of produced assets, and in the following year, higher COFC. It would also lead to a higher net worth (see yellow cells).

Example 2a) Value using NPV approach, entire data asset as produced (JZB)

	Year T-1	Year T	Year T + 1
GVA	-	309	359
GFCF	-	134	134
COFC of produced assets	-	0	-45
OCV-Emergence of non-produced assets	-	0	0
OCV-Depletion of non-produced assets	-	0	0
	End Year T-1	End Year T	End Year T + 1
Stock of Produced assets	0	134	223

²¹ This scenario would also include firms that obtain their OPs free from publically available sources as well as firms who add additional data gathering devices to their output in order to provide additional ability to monetise their production, (i.e. smart T.V's and other home appliances).

Stock of non-produced assets	0	0	0
Financial assets	50	135	270
Net worth	50	269	493

60. If one wants to include a non-produced component, an option would be to value the total data asset based on its NPV, and then deduct the recording and processing costs from this total. This residual amount would then be considered as the non-produced component, in line with the examples 2b for PVDV and JZB. In *example 2b* of the JML scenario, the data asset is valued at 134, with the recording and processing costs amounting to 45. This would then result in a value for the non-produced component being equal to 89, its appearance being recorded in the OCV account. This would lead to the same GVA, GFCF and stocks of produced assets as in example 1a, but due to the appearance of a non-produced asset, and subsequent partial depletion in the following year, it would lead to a higher net worth (see green cells).

Example 2b. Value using NPV: recording and processing costs as GFCF, non-produced equals residual

	Year T-1	Year T	Year T + 1
GVA	-	220	270
GFCF	-	45	45
COFC of produced assets	-	0	-15
OCV-Emergence of non-produced assets	-	89	89
OCV-Depletion of non-produced assets	-	0	-30
	End Year T-1	End Year T	End Year T + 1
Stock of Produced assets	0	45	75
Stock of non-produced assets	0	89	148
Financial assets	50	135	270
Net worth	50	269	493

Section 7. Further considerations and questions in relation to the advantages and disadvantages of the various recording options

61. Section 6 presented the main differences in the impact on aggregate indicators when applying the various accounting treatments to the three ways in which firms obtain access to OPs. It raises several issues, which are directly related to the two main questions regarding the recording and valuation of data in the system of national accounts:

- **Does the data asset consist of a combination of a produced component and a non-produced component?**
- **What valuation approach should be applied to value the data asset and, in case it consists of a produced and a non-produced part, how to distinguish the underlying components?**

62. If one thinks that data assets are entirely the result of production, it would be straightforward to derive its value on the basis of the NPV, leaving apart practical considerations. On the other hand, in the case of the sum of cost approach, one would need to take a decision on which costs to take into account: recording and processing costs only, or also OP procurement costs.

63. If one would prefer to include a non-produced component to reflect the intrinsic value of the information embedded in the data asset, the question arises how to put a value on this non-produced part. If there are no OP procurement costs, only the NPV approach would be available to derive a value for this non-produced component. While conceptually this is not a problem, the difficulties in measuring assets using the NPV approach must be recognised.²² In the case of OP procurement costs, the sum of cost approach would also be available to derive the relevant values of the produced and non-produced part. This raises the question whether it's appropriate to have different measurement approaches dependent on how the firms obtain access to the OPs.

- **From a conceptual point of view, should all data assets be treated the same, i.e. should all data assets be regarded as either fully produced or consisting of a produced and non-produced part? Or could this be made dependent on the way that access to OPs is obtained?**
- **Should one allow for the application of different valuation methodologies, dependent on the way that access to OPs is obtained?**

64. In case it is decided that the data asset consists of a produced and a non-produced component, an issue that is faced in all methods and scenarios, is where to draw the line between the OP procurement costs and the recording and processing costs. The above examples are relatively simple and straightforward. In real life, delineating the costs associated with accessing OPs may be quite difficult. The application of such a methodology may therefore require very clear guidance and extensive testing. Even if all costs are considered as produced, it may still be difficult to assign the appropriate costs in case of the dual use of an asset, e.g. in case software is used as a means to obtain greater access to OPs as well as a platform for advertising. In the example provided, this was simply split in half, but obviously such a simplistic split is unlikely to be appropriate for the real world. It is important to also consider the need to correctly reflect the capital services contributing to the "other" output, i.e. advertising services.

- **If OP procurement costs are included in the sum-of-costs approach, how to determine the specific costs involved in procuring the OPs, particularly in the case of dual use of an asset?**

65. For the NPV approach, in case of incorporating both a produced and non-produced component, one would need to value one of the two components on the basis of the sum-of-costs, while the other part is calculated residually.

66. It is possible to derive the non-produced component on the basis of the OP procurement costs and to derive the value of the produced component residually. However, this would mean that the value of the produced component (and therefore the value added feeding into GDP) has no constraint, with potential negative effects on the usefulness of indicators such as GDP. Conversely, the non-produced component could be calculated residually, with the produced component based on sum-of-costs. In this method, GDP is calculated more prudently, with only actual expenditures that have occurred contributing to the produced part. However, this may result in situations where the value of the non-produced component is not equivalent to the intrinsic value of the OPs, particularly if OP procurement costs are allocated to the produced part.

²² So far, all attempts to place a value on data have involved a sum of cost methodology, not only because of the practical benefits that such an approach brings, but also because of the prudence of this approach.

67. In respect of applying the NPV-methodology, it may be problematic to single out the resource rents that can be assigned to the data asset. One may only be able, for example, to use the total net operating surplus of a data driven company as an approximation. It's clear, however, that this may lead to including resource rents that are not directly related to the data asset. As shown by the huge market value assigned to data driven businesses – which effectively is a stock market evaluation of future profits – things such as potential monopolistic network effects, rent seeking due to market power, contributions from other unknown capital, volatility of and price bubbles in stock markets, etc. may feed into the value of the data asset as well. If one is not able to remove these elements, the NPV-methodology may be seen as an inferior one. This becomes even more worrying in the case the full value, or the residual value after deducting some costs for procuring OPs, would have a direct impact on main indicators such as GDP and GFCF.

- **Should the value of the produced component of the data asset always be limited to its sum-of-costs?**
- **If a non-produced component is included within the data asset, should this non-produced component always equal its OP procurement costs?**

68. In the scenario of explicit payments for obtaining access to the OPs, the difference between a rent payment and a purchase of a non-produced asset also requires closer inspection. Based on the general agreement that an OP is not the result of productive activity and assuming that there is no appetite for extending the production boundary for the household sector, the relevant purchases cannot be recorded as intermediate consumption. However, in the examples listed, it would appear that while JZB is able to exert control over the information elements it derived from the OPs it accessed, there is nothing to stop the household from selling access to the same OPs to someone else. So, while JZB can exert control over its own information elements, it cannot obtain exclusive control over the OPs. As both parties in the transaction, i.e. the household selling access to the OPs and the firm acquiring access to the OPs, have the same access and knowledge, the firm cannot become the sole economic owner of the information embedded in this non-produced asset. The question is whether this should have an impact on the way the OP procurement costs are reflected in the accounts: a payment of rent or a payment for the purchase of a non-produced asset.

- **Should a fundamental assumption be made that rules out any production coming from the household sector in relation to OPs and data?**
- **Should firms be considered as purchasing a non-produced asset, even if they don't become the sole economic owner, or should the exchange be recorded as rent?**

69. If this exchange is considered a rent payment for access to a non-produced asset and if this would be regarded as an important component for the sum-of-costs approach to arrive at a value of the produced asset, then a change to the SNA would be required, to possibly include payments of rents in the calculation of own account investment.²³

- **If explicit payments to households are considered a rent payment, should it be made possible to add these costs to the sum-of-costs in creating the data asset?**

²³ If this treatment is favoured, the SNA would also require additional clarification on the classification of OPs (see section 2) as well as acknowledging that a rent payment may be paid to a holder of an asset despite the asset not actually being recorded on the balance sheet of the recipient

70. For the sum of cost approach, while there are similarities between the example for PVDV and JZB, in so much that they both face additional OP procurement costs, the relevant costs are very different. In PVDV, the costs refer to a combination of labour and capital inputs to produce a search website, a key component of producing the data asset. This has the hallmarks of a production process, with the exception that the output is provided for free. On the other hand, in the case of JZB, the OP procurement costs are simply payments to purchase something. It relates to a transaction for access to, or ownership of, a non-produced asset. Should both cases be treated the same way, when determining the level of production required to produce the final data asset?

- **Should the distinction between including or excluding OP procurement costs, when applying the sum-of-costs approach, depend on the type of costs, i.e. derived from “productive activities” or acquired on the basis of an outright purchase?**

Section 8. Concluding remarks

71. In direct response to the most recent meeting of the Advisory Expert Group (AEG) on National Accounts, this paper has tried to provide more clarity on how OPs and data might be recorded and valued in the SNA. It progresses the discussion on whether data assets should also reflect any intrinsic value of observable phenomena (OPs). Finally, the note shed light on how the capitalisation of a data asset might be accounted for across the sequence of accounts including balance sheets, depending on the answers to the questions above.

72. Section 2 of the paper focused on the first part of this discussion, by advocating for a position whereby OPs are considered as having some intrinsic value and displaying some asset qualities. In doing so, it first and foremost looked at the real world evidence supporting this idea, as well as presenting the disadvantages that may result, if OPs would be excluded from the SNA asset boundary. However, the paper also advocated a proposal that, for practical reasons, **OPs may best be excluded from balance sheets, with transactions shown only in cases when an explicit monetary transaction takes place.**

73. The paper, after explaining the various methods deployed by firms to obtain OPs and explaining possible methods to value data, presented three theoretical examples, with the different measurement options available. It tried not to advocate any particular position, rather the paper discussed the outcomes for each example, along with the advantages and disadvantages that might result from the respective measurement options.

74. From these examples, a range of questions were derived. Once discussed and decided upon, a further iteration of the options for recording and measurement will be done.

- **Does the data asset consist of a combination of a produced component and a non-produced component?**
- **What valuation approach should be applied to value the data asset and, in case it consists of a produced and a non-produced part, how to distinguish the underlying components?**
- **From a conceptual point of view, should all data assets be treated the same, i.e. should all data assets be regarded as either fully produced or consisting of a produced and non-produced part? Or could this be made dependent on the way the OPs are obtained?**
- **Should one allow for the application of different valuation methodologies, dependent on the way the OPs are obtained?**

- If OP procurement costs are included in the sum-of-costs approach, how to delineate the specific costs involved in procuring the OPs, particularly in the case of dual use of an asset.
- Should the value of the produced component of the data asset always be limited to its sum-of-costs?
- If a non-produced component is included within the data asset, should a sum of cost approach always be based on its OP procurement costs?
- Should a fundamental assumption be made that rules out any production coming from the household sector in relation to OPs and data?
- Should firms be considered as purchasing a non-produced asset, even if they don't become the sole economic owner, or should the purchase be recorded as rent?
- If explicit payments to households are considered a rent payment, should it made possible to add these costs to the sum-of-costs in creating the data asset?
- Should the distinction between including or excluding OP procurement costs, when applying the sum-of-costs approach, depend on the type of costs, i.e. derived from "productive activities" or acquired on the basis of an outright purchase?

75. While some decisions regarding the recording of data in the system of national accounts will remain subject to individual interpretation, it is felt that there is a general consensus in respect of a number of issues and/or principles, as follows:

- A preference for a "prudent" estimation methodology for any produced data asset, in the sense that the methodology should not lead to significant and open-ended changes to GFCF and GDP.
- A preference for not recording any extension of the production boundary, when it comes to the emergence of OPs, especially within the household sector.
- Any methodology should be practically feasible, when it comes to implementation.

76. With this in mind the following decision tree is able to funnel compilers to one of the proposed methods based on more subjective questions, that is: (i) should any calculation for the produced component include OP procurement costs as well recording and processing costs? and (ii) should data assets include a non-produced component?

Explicitly include OP procurement costs as contributing to the produced value?					
No		Yes, if it requires intermediate, labour and/or capital inputs		Yes, always	
Include a non-produced component to the data asset?					
Yes	No	Yes	No	Yes	No
1B if explicit payment treated as purchase of NPA; 1C if explicit payment treated as rent	1A	Not possible with SOC, as value already used for non-produced component	1A for JZB; 1D for PVDV	Not possible with SOC, as value already used for non-produced component	1D

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