

## EXECUTIVE SUMMARY

### Introduction

One of the major innovations in the 2008 SNA is the recognition of expenditures on research and experimental development (R&D) as capital formation. The following was agreed by the United Nations Statistical Commission in 2007:

- a. Research and development should be treated as gross fixed capital formation in the SNA. It should be defined as in the *Frascati Manual*<sup>1</sup>, namely “research and experimental development comprises creative work undertaken on a systematic basis in order to increase the stock of knowledge, including the knowledge of man, culture and society and use of this stock of knowledge to devise new applications.” This definition should not be interpreted as including human capital as capital formation within the SNA.
- b. By convention, since much R&D is carried out on own account, it should be valued at cost. In practice, the information collected in accordance with the *Frascati Manual* will provide estimates of R&D expenditure; discussion is ongoing to make adjustments to this Manual to meet the needs of the SNA more closely. It is recognised that a detailed guide to implementation will be desirable to assist implementation of this recommendation.
- c. All R&D expenditure that is sold or is expected to bring a benefit in the future to its owner (including for the provision of public services in the case of R&D undertaken by government) is included within the asset boundary. Only R&D that brings no economic benefit discernable at the time of its completion is excluded.
- d. With the inclusion of R&D in the (fixed) asset boundary, patented entities will no longer be separately identified as such in the system, but they will be subsumed into R&D assets.

While there is strong support by countries for adopting these recommendations in the SNA, there is also considerable concern that it is premature to do so because of technical difficulties that have yet to be overcome. In conclusion, R&D expenditure should be recognised, in principle, as part of capital formation. However, recognising the difficulties to be overcome before this objective can be reached, satellite accounts will provide a useful way of working towards solutions that give the appropriate level of confidence in the resulting measures and practical guidance on implementation will help to ensure international comparability. Therefore, the 2008 SNA will describe the objective and its conceptual underpinnings, note the difficulties and provide links to work underway to overcome them and recognize that for many countries implementation will take some time. The ISWGNA will report periodically to the UNSC on progress and signal when widely accepted implementation guidelines are available.

The need to address the concerns raised in the last paragraph provided the impetus to create OECD and Eurostat task forces to develop recommendations and guidelines for compiling capital measures of R&D, and hence this handbook. A considerable amount of work was undertaken during the development of the 2008 SNA by members of the Canberra II Group on the Measurement of Non-Financial Assets, including the compilation of R&D satellite accounts. This provided the springboard for the work of the OECD Task Force on R&D and Other Intellectual Property Products that has culminated in the guidelines and recommendations presented here. These represent the views of the Task Force based on the current state of knowledge.

It is clear that further work will need to be undertaken in the data development area. In particular, the handbook describes and advocates the development of dedicated surveys for R&D service lives and international trade in R&D. With regard to service lives, pilot surveys conducted by some member countries of the Task Force have proved encouraging.

It is important to state that whilst this Handbook provides information on the conceptual basis, and often intellectual rationale, for the recording of transactions involving IPP products, its primary purpose is to provide practical recommendations on measurement consistent with the concepts and recommendations described in the 2008 System of National Accounts.

Chapter I of the Handbook begins by discussing the treatment of IPPs in a generic sense, concentrating on their shared characteristics, the common general approaches that can be used to measure transactions in IPPs, and the common problems that impact on measurement. Subsequent chapters look at each of the four main categories of IPPs (R&D; mineral exploration and evaluation; software; and entertainment, artistic and literary originals) in more detail, focusing, in particular, on specific measurement aspects of each and their sub-categories.

## Overview

The key characteristics that, in many ways, differentiate IPP products from other goods and services are that they:

- are typically one-off (unique) but reproducible,
- are often produced on own-account,
- are not subject to wear and tear like conventional assets, and
- can be readily reproduced with minimal physical production costs.

These characteristics raise a number of issues related to measurement. The most important is the differentiation between gross fixed capital formation (GFCF) and intermediate consumption. In concept, IPPs should be treated like any other good or service, and expenditures on IPPs should be recorded as GFCF if they satisfy the definitions provided in the System of National Accounts (2008 SNA paragraph 3.30).

But, there are some specific issues peculiar to IPPs where an elaboration of the rules that determine whether expenditures should be classified as GFCF is needed. Many IPPs, for example, can be reproduced and these reproductions may also satisfy the requirements to be recorded as assets in their own right. In addition, companies are able to purchase the rights to reproduce IPPs, and these rights may also satisfy the requirements to be recorded as assets.

In considering how these transactions should be recorded it is essential to make a distinction between what is known as the ‘original’ IPP (which may be used solely for the purposes of ‘producing’ reproductions or used directly in the production of different goods and services), and the copies and rights to copy. Not all copies should be recorded as assets but all original IPPs expected to be used in production for more than one year should be, irrespective of whether they are used solely to produce copies or directly in the production of other goods or services.

## *Licenses to use*

Licenses to use (reproductions) are separate products, and costs of their acquisition can also be recorded as GFCF if they too satisfy the asset requirements of the 2008 SNA (in particular the licenses must be for more than one year). The value of the original is related to the expected (net present value) sales of these licenses but it is important to note that whatever the eventual actual sales of the licenses, which may differ from the expectations, GFCF for the original does not change. The value of the original on the balance sheet, however, should change in line with any change in prices or volumes (in the other changes in assets accounts).

### ***Licenses to reproduce***

Licenses to reproduce are also products whose costs of acquisition can be recorded as GFCF if they satisfy the asset requirements of the 2008 SNA. However, if they do, they should be regarded as the sale of part or whole of the original. If they do not meet the asset requirements of the 2008 SNA then the costs of acquiring them are recorded as intermediate consumption.

### ***Valuing originals***

Valuing the ‘original’ is arguably the biggest challenge for statisticians, as the great majority of originals are either produced wholly or partially on own account and it is relatively uncommon for originals to be traded. Therefore there is generally no market price observable and given the nature of IPPs it is generally not possible to impute the basic price. As such, the Handbook (and the SNA) advocates a sum of costs approach (including an estimate of the return to capital used in producing the original). But this is not the end of the story. Many originals take longer than one year to build and so, strictly speaking, expenditures on producing originals that occur in earlier years should be recorded as works-in-progress (with these expenditures reallocated to GFCF in the year of completion). This is not easy to achieve in practice and, so, instead, the SNA and the Handbook pragmatically recognise that these expenditures should be recorded as GFCF when they occur.

### ***Unsuccessful originals***

Not all expenditures and effort in producing IPPs lead directly to the successful creation of an original. This raises the contentious question of how to deal with unsuccessful ‘originals’. There are conceptual arguments both for and against the inclusion of unsuccessful originals as GFCF. Recognising the merits of both arguments, the Handbook adopts a pragmatic approach, and recommends that expenditures incurred in the creation of originals that eventually prove unsuccessful should be recorded as GFCF. Moreover the Handbook does not recommend that the value of the assets is recorded at zero at the point they are proven to be unsuccessful.

### ***Freely available IPPs produced by government***

One of the requirements for an asset to be recorded in the SNA is ‘ownership’, that is for owners to have effective management and control of the assets that result in economic benefits for the owner. Certainly IPP assets produced by government and used in the provision of non-market services such as health and education satisfy this requirement, even if the assets are themselves made freely available for use by others, including the market sector. But the issue of ownership in cases of IPP expenditures by government to create assets, given away freely, and not intended for use in the provision of non-market services by government is contentious. Philosophical arguments, both for and against the recording of these expenditures as GFCF exist and both positions have merit. In the end, this Handbook recommends, for pragmatic reasons, that all such expenditures by government, intended to result in an IPP that can be used in production for more than one year, should be recorded as GFCF.

### ***Double Counting***

IPPs can be developed for use in the production of other IPPs, for example software might be used or developed in developing R&D or vice-versa. If any of the IPPs produced on own account as inputs also satisfy the asset criteria then they should be recorded as such. The capital services they provide should then be included when summing costs to estimate the GFCF of the IPP they are being used to produce. Therefore the Handbook recommends that when asking units to estimate the costs of producing assets on own account they should be asked to separately estimate the costs of each IPP asset in the current period,

including the capital services provided from the use of other assets including other IPPs if possible. It is important to ensure, in using the sum of costs approach to valuating of IPP assets produced on own-account, that the same costs are not included in the valuation of more than one asset. Only those parts of intermediate consumption, labour, capital services etc used in creating an IPP asset should be included in the sum of costs.

### ***Depreciation***

Net measures of output, operating surplus, capital formation and capital stock are always important but the fact that both originals and copies of IPPs can be recorded as GFCF reinforces this importance. Therefore the Handbook provides comprehensive guidance on the approaches and potential surveys that could be used to ensure adequate measures of depreciation and capital more generally. The Handbook advocates the use of the perpetual inventory method (PIM) and encourages the use of the geometric model for age-price and age-efficiency functions.

### ***Supply and demand approaches to measurement***

The Handbook provides detailed guidance on the approaches and sources that can be used to measure GFCF for each IPP category. For most categories, in particular software and R&D, it advocates the use of both supply and demand approaches to measurement. In the case of the demand approach, particularly for R&D, the handbook provides examples of surveys that can be developed and used to collect data. In the case of R&D the Handbook also provides a detailed exposition of data sources used in collecting information as per the recommendations of the Frascati Manual.

### ***Trade in IPPs***

An area where considerable future action will be necessary is the measurement of international trade. Fortunately, steps to improve on the current situation are already being taken, notably in the area of product classifications such as the EBOPS classification system, the latest version of which will provide a much more detailed breakdown of IPP types. However, cross border trade between affiliated enterprises remains a priority development area.

### ***Prices and Volumes***

IPPs can be decomposed into three broad types: copies for sale, originals for sale, and originals for own-use. The Handbook makes explicit recommendations for volume estimates in each case, recognising the differences between each type, including, specifically, the availability of price data. For copies, the Handbook recognises the rapidly changing nature of IPPs and, so, strongly advocates hedonic methods. For originals for sale, the Handbook refers to the Producer Price Index Manual, which describes the various 'model' based approaches that can be used. Finally, for originals for own-use, the Handbook encourages the use of methods that capture quality and productivity changes, but when these cannot be applied recognises and accepts the necessity of input-based methods.

### **Key Recommendations**

A number of recommendations are made within the Handbook. The key recommendations are repeated for convenience below.

### *Differentiating between GFCF and intermediate consumption*

**Recommendation 3:** As a general rule, all expenditures on intellectual property products, either purchased or produced on own account, should be recorded as gross fixed capital formation if they are expected to provide economic benefits for the owner. Only in cases where units specialise in producing a type of intellectual property product for sale should acquisitions of that type of product be expensed, or if it is clear that they are completely embodied in another product: for example software copies purchased to be embedded in computers for sale, or other specific information exists such as the existence of a license with a duration of one year or less.

**Recommendation 30:** It is very important to distinguish between licences to use for more than a year and licences to use for a year or less. Expenditures on the former, purchased by production units and not embodied and sold on within other products, are recorded as GFCF, while expenditures on all other licenses to use are recorded as consumption. Whatever approach is used it is vital that the accurate discrimination between the two should be central to measurement.

### *Estimating own-account production*

**Recommendation 10:** When asking units to estimate the costs of producing assets on own account they should be asked to itemize their costs, separately identifying expenditures on other fixed assets. The latter should not be included in sum of costs. But estimates of the user cost of capital should be (but only the depreciation component for non-market producers). This can be done either by applying the perpetual inventory method to past estimates of capital expenditures or by making an imputation based on data for units specialising in the production of the particular intellectual property product.

### *Unsuccessful Developments*

**Recommendation 8:** When summing costs to estimate gross fixed capital formation of intellectual property products, all costs should be included, irrespective of whether the activity is eventually successful or not. Values of assets that subsequently prove unsuccessful should not be written off in the other changes in volume account. Instead they should be depreciated in the same way as similar classes of assets that prove successful.

### *Research and Development*

**Recommendation 16:** Ownership of an asset exists when the owner has effective management and control of the R&D output in order to ensure the expected benefits are obtained by the owner. There are more ways of ensuring this than patenting the R&D, for example by publishing R&D in a scientific journal. By doing this, others are prevented from claiming ownership.

**Recommendation 17:** As a practical solution, when the rights to benefit from the results of R&D are not clearly assigned by intellectual property protection, the owner should be deemed to be the purchaser or, in the case of own account R&D, the owner is deemed to be the producer.

**Recommendation 19:** As a general rule, all R&D purchased or produced on own account should be treated as gross fixed capital formation by the producer, except when the original is produced for sale (in which case it should be recorded as GFCF of the acquiring unit).

**Recommendation 20:** *Unless specific information to the contrary exists, all expenditures on purchases of R&D or on R&D production by market producers in the Scientific Research and Development industry (Division 72 ISIC Rev. 4) should be recorded as intermediate consumption, or otherwise expensed, on the presumption that such units produce R&D for sale, and any purchases are*

incorporated in products for sale. Only when specific information is available to the contrary should acquisitions of R&D be recorded as gross fixed capital formation, such as *R&D performed by start-ups that do not yet have sales* or cases when a unit takes out a patent and sells licences to use.

### ***Mineral Exploration and Evaluation***

**Recommendation 26:** It is reasonable to assume that the service life of mineral exploration and evaluation is similar to that of the associated sub-soil assets when using the perpetual inventory method to derive estimates of capital measures.

**Recommendation 27:** Care needs to be taken to avoid double counting the stock of mineral exploration and evaluation in the stock of sub-soil assets.

### ***Software***

**Recommendation 28:** Own-account software updates or upgrades should not include the value of the "original" version, and instead should only reflect the increase in value. The value of the upgraded software on the balance sheet comprises the value of the upgrade plus the depreciated value of the original version.

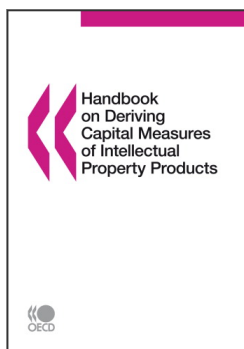
### ***Entertainment, literary and artistic originals***

**Recommendation 39:** Entertainment, literary and artistic originals should be defined to include at a minimum - films, TV and radio stock programmes, literary works and musical works. Other originals should be included if they meet all of the following four criteria:

1. The item must be covered by copyright.
2. The work should have primary artistic intent.
3. The item must satisfy the capitalisation criterion, the same as for any capital item to be included as gross fixed capital formation
4. The item is not covered elsewhere in the national accounts.

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1 OECD *Frascati Manual 2002: Proposed Standard Practice for Surveys on Research and Experimental Development*



**From:**

## **Handbook on Deriving Capital Measures of Intellectual Property Products**

**Access the complete publication at:**

<https://doi.org/10.1787/9789264079205-en>

### **Please cite this chapter as:**

OECD (2009), “Executive Summary”, in *Handbook on Deriving Capital Measures of Intellectual Property Products*, OECD Publishing, Paris.

DOI: <https://doi.org/10.1787/9789264079205-2-en>

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