Measuring Intangible Investment

Initial Guidelines for the Collection and Comparison of Data on Intangible Investment

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TABLE OF CONTENTS

CHAPTER 1. INTRODUCTION

There is a growing awareness in the OECD Member countries that an increasing part of total investment in the business enterprise sector is directed towards intangible "investment products" such as research and experimental development (R&D), marketing, training, software, etc. Nevertheless, data on investment in intangible products, "intangible investment" for short, is still relatively scarce (Kaplan, 1987; OECD, 1992*b*).

Innovation surveys, which are held regularly in some Member countries, produce, as a by-product, data on the magnitude of some components of intangible investment. However, the definitions used and the limited coverage of innovation surveys prevent them from being an adequate source of data on intangible investment.

In a few OECD Member countries *ad hoc* studies of intangible investment have been undertaken, based on existing statistical material and in one or two cases specially designed surveys have been launched. All this work indicates the value of statistical information on intangible investment and its importance for competitiveness and growth of industries and national economies.

National studies are scarce and internationally comparable data are even rarer. The *ad hoc* studies were in some cases based on existing national data on the relevant components, using the definitions pertaining to that existing data. The special surveys were designed for national purposes and used different definitions and did not cover the same topics.

At present, there is some debate about which of a number of possible components should be treated as intangible investments, although there is some consensus about the main topics to be included. Both the availability of data and theoretical motives lead to differences in the coverage of the subject in *ad hoc* studies.

There is a need for harmonized data on intangible investment for international comparisons of investment data (both international comparisons of intangible investment *per se* and comparisons between tangible and intangible investment as a whole) and to analyse the relation between, e.g. economic growth and investment. This paper addresses some data aspects of investment in intangible products.

The theoretical background of intangible investment, its definitions and its impact are the subject of earlier papers in this set. This paper concentrates on practical statistical topics such as data definitions, coverage, etc. and largely ignores conceptual questions.

Its plan is as follows: Chapter 2 deals with some general aspects such as the types of activity and the categories of expenditure to be included, sectoral coverage, etc. Chapter 3 explains the selected components in more detail, which results in definitions, possible sources, coverage, etc. Chapter 4 treats the problem of compiling a total and illustrates simple comparisons between spending on tangible and intangible investment respectively. Chapter 5 comprises some closing remarks, concerning the measurement of stocks of intangible fixed assets (the activation problem).

CHAPTER 2. GENERAL ASPECTS

2.1. Introduction

Generally speaking, there are three possible procedures to obtain data on intangible investment. At the opposite ends are specially organised surveys and the use of existing data from official and non-official sources *per se*. The adaptation of questionnaires for existing surveys takes an intermediate position.

In terms of quality of the results, most likely the best source for international comparisons of intangible investment would be a specially organised set of national surveys using harmonized definitions and survey methods. This procedure has been used for some decades for R&D statistics and is now underway for data on innovation. In both cases an OECD-tailored manual is used and the comparability of the various statistics has improved significantly, although some work is still to be done (OECD, 1992*a*; OECD/Eurostat, 1997; OECD, 1994).

This approach, which has been adopted in Finland and Norway for their ad hoc surveys described in Paper 5 of this compendium, has of course great advantages: operational definitions and concepts can be adapted to contemporary theoretical insights, double counting can be avoided, scope and sectoral coverage is known and some information on statistical margins is available.

Furthermore, if this intangibles survey is co-ordinated with existing investment and structural surveys, a micro-link between investment (both tangible and intangible) and other variables such as production, employment, profits and innovation is easily established, which greatly contributes to the insight in the economics of the firm. After all, a significant part of growth and competitiveness relates to the firm as actor on the economic scene.

However, budget constraints on government statistical work and the hesitation to increase the response burden on firms, among other things, make the prospects for OECD-wide harmonized intangibles surveys only modest. The use of existing data sources to compile statistics on intangible investment would be a more practical approach. This (in some sense second-best) approach, which was used in the other countries that launched research in this field, France, Netherlands, Sweden and the United Kingdom (see Paper 5), has been adopted in this paper, although the greater part of its proposals apply equally well to special surveys.

In many cases, the first attempts to compile statistical data on a given subject use existing data as such, accepting all disadvantages and flaws. When the need for data is clearly stated, eventually existing surveys evolve into a more appropriate supplier of statistics on that subject; definitions and scope of surveys are adapted, additional questions are designed and existing ones modified. In this manner, many of the advantages of a special survey can be achieved, without a substantial increase in costs or in the response burden. This approach implies a clear integration of intangible investment statistics with the statistics that will be used to analyse their impact, but also with the various statistics from which they are

to be compiled and also if possible with the data used by firms themselves in their company accounts and reports.

2.2 Definition and components

The main characteristic of an investment product is its ability to contribute to more than one production cycle. Furthermore, the investment process leads to the accumulation of some sort of asset. The operational definition of intangible investment used in this paper is as follows:

> Intangible investment comprises the current and capital expenditure for (in)tangible products that became available in the period under review and that remain in use for more than one year.

This is straightforward for most tangible investment topics as discerning between investments and current production factors is fairly simple. A building, a transport van or a packaging machine is clearly in use for several years and their identification poses no problems. One can see and touch them and check at any moment if they are still there and in operation. Minor "investment goods" such as tools, minor office aids and appliances, etc., are considered a current expenditure, mainly because they are booked as such in company accounts. In terms of coverage, the effect of this procedure on investment figures is negligible. Maintenance of investment goods is normally considered as a current cost for the same reason; major repairs, as an exception, are classified as an investment.

With intangible investment, distinguishing between investment and operating costs is not that easy, largely because intangible investments relate broadly speaking to services.[1] A service, by its nature, is very difficult to identify after it has been produced. Thus, traditionally, a service is said to be consumed the instant it is produced. In company accounts virtually no expenses for intangible products are considered to be capital expenditure (for reasons of prudence). As a result, the conceptual differences between statistics and accounting practices interfere with the compilation of quality statistics. The relationship between statistics and company accounts has already been raised in the preceding paper.

Applying the above-mentioned definition to the entire field of the services, e.g. the relevant entries in the CPC (UN, 1991), reveals that from a strictly theoretical point of view a multitude of services can be considered to have investment aspects. Most services, however, may be an investment on some occasions, while on others they should be classified as operating expenditures, depending on the lasting effect of the service in that setting. The weight of the investment aspect varies from product to product and perhaps from industry to industry.

Given these facts, two options are to be considered. The first approach is to collect once or twice every decade information on the proportion of the expenditure per product that can be classified as investment, in order to obtain information on the “investment content” of the different products. These weights might be used to compute total intangible investment using an annual data collection on total expenditure on the relevant intangible products. The obvious assumption is that the weights remain fairly stable. The advantage of this approach is that it produces a good approximation of intangible investment without a detailed annual questionnaire.

On the other hand, this method does require a very detailed survey once every five or ten years to collect the weights. This survey most probably will be quite extensive, given the large variance per product and (perhaps) per industry that may be expected. Furthermore, the weight for many products will most likely be small, making the survey inefficient. An alternative procedure to obtain a list of weights is the Delphi method of interviewing experts on the subject.

The second approach, adopted in this paper, is to concentrate the work on items with a major investment characteristic, while excluding those items which produce an asset only in a minority of cases. For the selected products total expenditure is regarded as an investment. This confines the effort to a fairly small number of items, many of which are relatively easy to observe or are already part of some survey.

This choice does not obviate all difficulties. Even items with a major investment impact in individual instances may have to be treated as current costs. The Finnish and the Norwegian surveys tried to solve this problem by asking for long-term operating costs incurred for some topics, excluding outlays yielding only a temporary effect. When compiling data from existing surveys, this way may be blocked. A mixture of the first approach, determining weights, and the second, using "centres of gravity" might be advisable in some cases.

Moreover, the distinction between maintenance of an existing investment and a new investment is very hard to determine. The Norwegian pilot survey tried to establish this demarcation by asking for outlays with elements of novelty, but that does not wholly solve the problem.

Despite these conceptual and practical problems in allocating outlays for intangible investment, in practice there is a consensus that six types of expenditure have a major investment impact.

The core components of intangible investment are:

-- research and experimental development (R&D);
-- education and training;
-- software;
-- marketing;
-- mineral exploration;
-- licences, brands, copyrights;
-- patents.

In Finland and the Netherlands, the first four components made up more than 80 per cent of their total intangible investment.

In addition to these six core components, the following expenditures may be classified as intangible investments:

Supplementary categories of intangible investment:

-- development of the organisation;
-- engineering and design;
-- constructions and use of databases;
-- remuneration for innovative ideas;
-- other human resource development (training excluded).

These other expenditure categories may be classified as an investment in some circumstances. It should be noted that the above list is not exhaustive.

Expenditures on the activities enumerated in preceding sections are not, by definition, entirely separate. There may be overlaps, e.g. between expenditure on licensing and software costs or between R&D and software. This should be solved by suitable basic definitions.

Investment products may be produced on one's own account or purchased from third parties. In the latter case, the product may be new or second-hand, or acquired through merger. The treatment of new or in-house produced investment products in investment statistics is straightforward; either the purchase costs or the production costs are entered. Of course, production of investment products such as machinery and equipment for sale is not regarded as an investment to the producing enterprise, but added to the stock of finished products. As noted in the preceding paper, this procedure ought to be used for intangibles too, but again the specific features of intangibles obscure the issue.

The inclusion of second-hand investment goods depends on the analysis and the level of detail the investment data is being used for. For analysing performance at a given level of sectoral detail, transactions with second-hand investment products within that sector should be left out, otherwise double counting would occur, especially in absence of good disinvestment statistics. In practice most (tangible) investment surveys include questions on second-hand investment goods, whereas the National Accounts leave them out.

Second-hand intangible products can in theory be treated in the same way as their tangible counterparts. For software, for example, this is straightforward. For some intangible products, there will be no second-hand market; due to their impalpability, they are inalienable (e.g. market power). On the other hand, some products can be sold without a corresponding reduction in the value of the original asset (e.g. licensing of a patented procedure). It is proposed to include second-hand intangibles. In practice, their importance is marginal.

Acquisition of intangible products through merger is the last case to be considered. When a take-over occurs, the assets of the minor enterprise are revalued and entered in the active side of the balance sheet of the enlarged enterprise. The difference between the take-over price and the value of the assets is goodwill and this amount in some cases is added to the intangible assets of the new firm.

In this goodwill the value of second-hand intangibles such as market power, knowledge and skills are present, among other issues such as a good reputation, an unique set of customers, etc. Part of this value is a result of marketing, after-sales service, training, management development, etc. In that respect the goodwill partly represents the value of a second-hand intangible asset.

However, in analogy with the treatment of tangible assets, it is proposed to exclude goodwill from the intangible investments. In tangible investment surveys, acquisition of assets through merger is excluded; the revalued assets are entered into the active side of the balance sheet. In analogy with this treatment of mergers in tangible investment surveys, acquisition of intangibles through merger (goodwill) should be excluded from the investment figures. In fact, the intangible assets which were present in the firm taken over were valued as a *pro memoria* item before the take-over, re-valued and entered with a non-zero value for the enlarged enterprise.

This does not imply that the take-over of a firm is not an investment for the buyer, but simply that its impact is recorded in other statistics.

It is proposed to concentrate initially on the six core activities: R&D, marketing, training and software, mineral exploration, rights. Chapter 3 discusses these activities in depth. In addition, it provides comments, which should be regarded as tentative reflections, on other possible components. Before this, the rest of the present chapter sets out some of the data requirements.

2.3 Data requirements

Compiling statistics from existing statistical sources is hampered by the fact that definitions and sectoral coverage do not necessarily match the initial requirements. This section, nevertheless, outlines some essentials of data collection pertaining to intangible investment.

2.3.1 Demand versus supply approach

Investment products are an input to the production process. This implies that traditional investment statistics provide data concerning new (or second-hand) buildings, machines and equipment being put into use in the year of observation, regardless of whether they are obtained from other firms or produced on one's own account. Preferably, data for intangible investment should comply with this approach.

> Data should be collected on the demand side, i.e. in respect of the firms purchasing intangible products from other firms or producing them in-house for own use.

In many cases, however, even when the data is collected on the demand side, information about the in-house production of intangibles is entirely lacking. In France and the Netherlands for instance, the annual enterprise statistics provide data about their advertising costs, but this refers only to advertising services purchased from other firms. Some Dutch research in this field indicates that this may result in considerable underestimation, especially for large firms with separate marketing divisions.

The same underestimation occurs when supply-based data are collected. Furthermore, supply-based data in most cases do not include information about the destination of the investment products, which prevents the breakdown of figures by size class or main economic activity of the investing enterprises.

Of course, for some types of analysis such as research into the flows of technology through the economy, the origin of the investment product is of interest. For this, information on the industry of origin is extremely valuable.

The last reason to opt for a demand approach is that it avoids conceptual ambiguities about the inclusion of topics in intangible investment. Strict application of this "view of the receiving firm" solves a good deal of such problems.

2.3.2 Sectoral coverage

> Sectoral coverage should be confined to the Business Enterprise Sector, at least initially.

Most likely the greater part of intangible investment is undertaken by this sector. Furthermore, problems with definitions in the public sector are severe.

2.3.3 Statistical units

> It is recommended that data should be obtained from statistical sources that use the enterprise-type statistical unit.

By "enterprise-type unit" is meant the smallest possible separate legal entity with a degree of economic independence. In some cases, especially when the enterprise is engaged in many branches of activity, a smaller unit (for example, a division of the enterprise such as an establishment or a kind-of-activity unit) could be used. In general, the enterprise group should not be taken as the statistical unit.

By using statistics based on enterprise-type units the link between statistics on intangible investment and other important topics such as production, profits and tangible investment can be fully established. Analysis can benefit greatly from this harmonized approach. When compiling intangible investment series based on existing material however, the statistical unit used is often dictated by the source matter. This subject will be given further attention when discussing the availability of data per component.

2.3.4 Classifications

When a breakdown of totals is possible, the most important classification is that by main economic activity. The International Standard Industrial Classification (ISIC) has traditionally been used for this purpose in OECD statistical work. The most recent version (ISIC Rev. 3) is closely harmonized with the industrial classification to be used in the European Community and the EFTA countries (NACE Rev. 1). The classification chosen should be compatible with those used in allied international surveys databases.

The breakdown of firms by size should be by number of employees. This basis for classification is also used in other relevant material such as statistics on R&D, innovation, production, tangible investment, etc. The classification below combines the classes suitable for large and small economies. The classes can be merged according to the countries' own requirements and the availability of data. In small economies, for instance, the number of enterprises with 1 000 employees and more is very small. In the Netherlands, in official statistics the largest size class is 500 and above.

Number of employees:

less than 20
20 - 49
50 - 99
100 - 499
500 - 999
1 000 - 1 999
2 000 - 4 999
5 000 - 9 999
10 000 - 24 999
25 000 and above

When special surveys are mounted, a number of other classifications may be used. Examples given are classifications by public sector and private sector enterprises, main type of good produced (consumer, intermediate, investment goods), R&D intensity (low, medium high) or export intensity.

The opportunity to use the above-mentioned classifications depends greatly on the availability of institutional statistics for the components of intangible investment. Few example, dissemination of regional statistics on intangible investment may be of interest, but the choice of the enterprise as the statistical unit excludes this option for the moment.

2.3.5 Double counting

Double counting should be avoided. The primary cause of possible double counting may be an overlap between the definitions of several kinds of intangibles. These will be dealt with in Chapter 3.

Secondly, in the course of combining the in-house production and the purchase of an intangible investment component, both the service production costs and purchasing price may be observed and as a result may be counted twice. For instance, when a survey registers, on one hand, the development costs of a software producing firm and, on the other hand, the value of software sales to the customers, the development costs will be counted twice.

For tangible investment, this problem is not that pronounced because production of investment goods for sale is not capitalised by the producing firm, but added to the stock of finished goods. It is only capitalised when it is taken into operation by the producing firm itself. The impalpability of the intangible investment products makes the concept of stocks of finished goods a little diffuse, while accounting rules on the other hand prohibit capitalising services. Again the discordance between needs of economists (assets producing services) and accounting practice lies at the root of the problem.

There may also be double counting with conventional investment figures. Some services accompanying a tangible investment product are included in tangible investment, for instance system

software or turn-key project training services. The first procedure is legitimate, in accordance with the definitions in force, but the training service should be excluded. Conversely, tangible investments may be needed for intangible investment activities such as R&D or training and may be included in the available expenditure data.

Whether or not the traditional investment figures should be "corrected" for intangible components depends on the use of the statistics on intangible investment. If the goal of the exercise is to produce a total investment figure, no corrections will be necessary. When intangible investment is the sole topic of interest, intangible components should be filtered out from the traditional investment figures. However, using current definitions, this type of double counting is of minor importance.

2.4. Company accounting conventions

Although this paper concentrates on the need for statistics on intangible investment and not on accounting conventions for the treatment of services with investment characteristics, some comments on accounting rules are appropriate.

Accounting rules are of interest to statisticians. First of all, it should be noted that in order to obtain economic statistics concerning enterprises, the latter must have suitable internal sources of data. Collecting statistical data may be severely hampered by insufficient data availability within firms.

The official accounting conventions set the standard, although firms do keep internal accounts using deviating accounting rules. Correspondence between statistical definitions and accounting rules has many advantages, i.e. data definitions are crystal clear, thus facilitating answering the questions. Furthermore, firms have easy access to the data in question, which results in a better response and homogenous data.

In all OECD countries, it is permitted to treat a few intangible items as capital expenditure and enter them in the balance sheet. Common topics include: R&D expenses, costs for concessions, for patents and licences, paid goodwill, etc. However, international harmonization of accounting rules suffers from the same weakness as harmonization of statistics: differences between national standards were large from the outset and progress has been made, but only rather slowly.

Nevertheless, the fact that firms may enter services in the balance sheet does not imply any obligation to do so. Insertion is compulsory in several OECD countries and, as a result only a minority of the firms treat these expenses as a capital expenditure.

Finally, balance sheet information pertains to the group of enterprises; especially for single enterprises that are part of a concern, often no balance sheet information is available, which hinders the production of useful statistics, especially relating to industry branches or size classes.

In conclusion, for intangible products, the division between capital and current expenditure in companies' own book-keeping records does not approximate sufficiently well to the division between investment and consumption that is required for the purpose of this manual. The growing awareness of the investment aspects of expenses in several intangible products may induce changes in this respect, but in the short run it is unlikely that balance sheets can serve as a source of statistical data on intangible investment.

In several countries some relevant expenditure categories can be identified on the profit and loss account, and these are to be transferred from current to capital expenditure using the methods outlined in Section 2.2. In some sense, this is a heroic remedy for the lacking capital expenditure data in intangibles. A significant improvement in data availability is to be expected from developments in accounting practice, partly induced by the need for statistical data on intangibles. Especially in industries with significant intangible assets such as brands (e.g. beverages and tobacco), and rights (publishing), there is a trend towards valuation of these assets.

CHAPTER 3. INTANGIBLE INVESTMENT BY COMPONENT

This chapter describes in detail the relevant features of the components of intangible investment and comments for each one on the following topics:

- a general definition;
- the reason why the component is considered to be an investment;
- a detailed (theoretical and pragmatic) description of the expenditures to be included;
- sources of double counting and their impact;
- data sources.

3.1 Research and development (R&D)

According to the *Frascati Manual* (OECD, 1994):

> R&D comprises creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society and the use of this stock of knowledge to devise new applications.

Three activities are covered:

- **Basic research:** experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view.
- **Applied research:** original investigation undertaken to acquire new knowledge, directed primarily towards a specific aim or objective.
- **Experimental development:** systematic work, drawing on existing knowledge gained from research and/or practical experience that is directed towards producing new materials, products or devices, instalment of new processes, systems and services, or substantial improvement of those already produced or installed.

A general consensus exists about the investment character of R&D,[2] at least from the point of view of firms performing R&D to generate knowledge and applications, which will serve them on a long-term basis.

In some countries, accounting conventions enable firms to account for R&D costs in the balance sheet. This implies that a term in the profit and loss account exists as well, which greatly facilitates the extraction of statistical data.

Data on R&D costs are available from the harmonized R&D statistics, for which surveys are carried out at least every two years in the majority of OECD countries. Results for the Business Enterprise Sector relate to enterprise-type units and are broken down by branch of industry (ISIC) and, in most countries, by size class. Both costs of in-house production financed by own funds and for the purchase of R&D from third parties are recorded. Separate data are collected on labour costs, other current costs and investments in land, buildings and equipment.

Although the national surveys are not fully comparable in all respects (e.g. because of differences in statistical units used and size classes covered, etc.), the international comparability of the figures is high and the time series exist from the early 1960s onwards. The details are dealt with in a separate paper in this compendium.

> The intangible investment of a firm or industry should cover the cost of R&D purchased from third parties plus in-house production of R&D for own use (labour and material costs including the depreciation of the (im)material fixed assets used to produce the R&D and some overhead).

Industrial R&D surveys are addressed essentially to the producers (performers) of the R&D rather than the users, although most also include questions on "extramural" payments for R&D to third parties. It is, however, necessary to adjust the in-house production data to exclude R&D undertaken for third parties.

For several reasons the questionnaire for R&D statistics surveys requests data on gross investment in tangible fixed assets and contains no question on depreciation. Two possibilities are left open when adjusting such data for use as intangible investment sources. First, the theoretically preferable method is to compute depreciation figures on the basis of a time series of investment figures (using some suitable method). For the total Business Enterprise Sector this method could be used, but severe problems occur for branches of industry. Migration of firms from one industry to another would imply the migration of their assets in order to compute fiable depreciation figures.

An alternative could be to treat the tangible investment expenditures in the year of observation as a proxy for the use of tangible fixed assets in that particular year. This method was used in the Dutch study. However, the handicap of this method is that large variations in tangible investment to be used to produce R&D,[3] result in relatively large variations in the data for intangible investment in R&D. In spite of these drawbacks, the last method is recommended.

The *Frascati Manual* addresses the boundaries of R&D with related activities such as education and training, other scientific and technological activities and other industrial activities in considerable detail. On the whole, these boundaries are relevant to the subject of this paper and they will be discussed in the following sections.

3.2 Education and training

3.2.1 Forms of training

> Training comprises all the various processes, both formal and informal, through which individuals develop, maintain and enhance their workforce skills.[4]

In terms of a continuum, training varies from highly structured educational type instruction at one polar extreme, through highly structured and highly unstructured on-the-job training activities, to learning-by-doing at the other polar extreme. Lying along this continuum are: learning by studying printed materials, e.g. manuals, books, articles, etc.; learning by attending job-related talks, classes, lectures, seminars, workshops and conferences; learning by watching co-workers, i.e. sitting next to Nellie. Enterprise-based training may assume all these forms.

If training is to be properly measured, its various forms must be clearly delineated and precisely defined. The issue of definition will be examined in the OECD Manual on Training Statistics mentioned in Paper 10 of this compendium (OECD, 1997). Here it is noted that a given form of training may be distinguished by the application of key criteria relating to:

i) the planning and design of training;

ii) who imparted the training;

iii) the location of the training.

In respect of the planning and design of training [point *i*)], the key criteria comprise:

a) the training content was planned in advance;

b) the training was designed by qualified instructors;

c) only instruction or monitored practical work occurred during the training session;

d) output was produced jointly with the training;

e) the primary objective of the activity was to develop, maintain or enhance workers' job skills or knowledge;

f) the training occurred solely through consultation of printed material;

g) the training occurred solely through consultation other co-workers;

h) the training occurred solely through attending work related talks, conferences, etc.;

i) the training occurred solely by observing other co-workers;

j) the training occurred solely through work experience.

The key criteria relations to the imparters of the training [point *ii*)] are if the training:

k) was imparted by qualified instructors (though not necessarily physically delivered by them since the training session may be pre-recorded, computer-based or electronically transmitted);

l) was provided by co-workers who were not qualified instructors.

Concerning the location of the training, the key criteria [point *iii*)] are if the training:

m) was undertaken off the job in an area conductive to learning, e.g. a vestibule, classroom, lecture theatre, etc.;

n) was undertaken on the job.

Application of these criteria to each training "pedigree" produces the results set out in Table 1. This table demonstrates the salient features of each type of training activity, besides indicating critical differences between them.

Thus, educational-type instruction differs from highly structured on-the-job training only in terms of *l*) and *m*), i.e. if the training was undertaken on or off the job. Essential differences between the polar extremes of on-the-job training, i.e. highly structured on-the-job training and unstructured on-the-job training, emerge in respect of:

a) (if the training content was planned in advance),

b) (if design was by qualified instructors),

c) (if only instruction or monitored practical work was undertaken),

d) (if output was produced jointly with the training),

e) (if the training was imparted by qualified instructors) and

f) (if the training was provided by co-workers).

Other categories of on-the-job training may be defined with reference to unstructured training. Thus, if only training which accords with all the characteristics of point 3 in Table 1 is admitted as unstructured on-the-job training, any other type of on-the-job training which does not accord with one or more of these characteristics should be classified as a given form of structured training. On this basis, structured training as a category would comprise training that was structured to different degrees.

The critical differences between unstructured on-the-job training and learning-by-doing are shown in Table 1 in respect of *e)* (if the primary objective was to develop, maintain or improve workers' jobs skills or knowledge), *j)* (if the training occurred solely through work experience) and *l)* (if the training was provided by co-workers).

Table 1. Different forms of training

	Type of training	Essential features													
		Planning & design										Imparter		Location	
		a)	b)	c)	d)	e)	f)	g)	h)	i)	j)	k)	l)	m)	n)
1.	Educational-type instruction	Y	Y	Y	N	Y	N	N	N	N	N	Y	N	Y	N
2.	Highly structured on-the-job training	Y	Y	Y	N	Y	N	N	N	N	N	Y	N	N	Y
3.	Unstructured on-the-job training	N	N	N	Y	Y	N	N	N	N	N	N	Y	N	Y
4.	Learning-by-doing	N	N	N	Y	N	N	N	N	N	Y	N	N	N	Y
5.	Learning by studying printed material	P	N	P	P	Y	Y	N	N	N	N	N	N	P	P
6.	Learning via organised group discussion	P	P	P	P	P	N	N	Y	N	N	P	P	P	P
7.	Learning by attending job related talks, etc.	P	P	P	N	P	N	N	N	N	N	P	P	Y	N
8.	Learning by asking co-workers	N	N	N	Y	Y	N	Y	N	N	N	N	Y	N	Y
9.	Learning by asking co-workers	N	N	N	Y	Y	N	N	N	Y	N	N	Y	N	Y

Legend: Y = yes; N = no; P = possible

3.2.2 Training by companies

A robust definition of training by companies, containing the essentials, might be: [5]

> An activity, financed wholly or partly by enterprises (directly or indirectly), in order that the persons employed by them might improve, acquire or maintain their job-related skills, knowledge or qualifications.

Education and training of employees shows a clear-cut investment aspect in that the employees acquire knowledge and skills that will be of value to the firm in the years to come. In most cases, innovation or modernisation is inconceivable without an accompanying training programme.

The (tentative) definition, however, clarifies that not all training can be classified as an investment: in theory, any expenditures on maintenance of skills or knowledge should be accounted for as a current cost (*cf.* maintenance of equipment). In practice, the available data will not permit such a distinction. It is therefore proposed to include all the training expenses listed below.

Because the prime intention of this paper is focused on intangible investment by firms, its scope is company expenditure in order to train and educate their employees, both internally and externally. This excludes the costs of the general education system or of other sorts of training undertaken without financial support by firms, which may be of interest in a human capital framework.

All of the types of training mentioned in Table 1 entail costs. Theoretically, these should be included if they are company costs. Direct observation of the costs related to several types is to be preferred. The education and training expenditures of firms should comprise the following topics:

> -- staff and material expenses, related to an in-house training division/department (overhead included);
> -- outlays for external training seminars;
> -- reimbursements for training costs;
> -- reimbursements of travelling costs which are related to training;
> -- costs for the loss of working hours because of training.

Enterprise-based expenditure on training should be net of the money value of saleable output produced during training; contributions from employees for their training and payments received from third parties for training services. In practice, however, these benefits will not be known and it is proposed not to take this aspect into consideration.

For structured, planned, training activities such as training courses, the direct observation of training costs is feasible, although not without difficulties. Especially the costs for the loss of working hours will pose problems.

The costs related to less structured training activities, such as (un)structured on-the-job training and attendance of seminars and congresses, however, are not easy to track down. In this case, observation of the direct input of working hours and subsequent multiplication with hourly labour costs might be an alternative. It should be noted that with this method, the more indirect costs such as those of support by superiors or colleagues are excluded.

Costs of training apprentices, trainees from outside the firm and the like are excluded. The main reasons for this proposal are the fact that in many countries apprentices are part of the general education system and that it is very uncertain whether the apprentices will enter into the workforce of the company after completing school.

Except for one country (France), no requirement to keep accounts on training are known. In many countries a plain account term is missing.

Given the fact that costs to enterprises are the main interest, enterprise-based surveys should be able to provide the necessary data. In some cases information derived from employee-based surveys (e.g. on attendance of seminars, etc.) could be used as an additional data source.

Internationally harmonized data sources are being developed; to date national exercises are not internationally comparable. The main problems are the lack of a good definition, clarifying which topics should be included or excluded, and the existence of two separate survey methods. The first one conducts an inquiry among employees, the second one among employers (enterprises).

Strict comparability is still a long way off, although both OECD and Eurostat are working on the harmonization of definitions and observation methods.[6] For the EC, a harmonized company survey is planned over 1994. In this survey, for structured, course-type training the accompanying costs will be observed, while for the other types of training only the number of working hours or the incidence will be recorded.

Overlap between training and R&D only relates to training of R&D personnel although the *Frascati Manual* explicitly excludes training of R&D personnel from the R&D expenditures. For individual firms this overlap may be significant, at industry level it will be negligible. Provisions for double counting are not necessary.

3.3 Software

Software can be defined as:

The mandatory series of instructions for digital instrument operations, comprising:[7]

- system software;
- tools software);
- application software, subdivided into:

  -- standard software;
  -- custom software (tailored for special use).

The following definitions are provided by the model survey of computer services (UN, 1992):

> **Systems and user tool software** are used to control the operations of computer systems and to support the development of systems or application software. This category includes, among others, communication and distributed data processing software (monitors, remote job entry, terminal support, etc.), compilers (assemblers), data management software (data entry and validation, file organisation, handling, maintenance, matching and retrieval, file organisation, handling, maintenance, matching and retrieval, etc.), development aid software (file conversion, program optimisers, program testing, translators, CASE tools, etc.) system software (emulators, simulators, job accounting, systems security, etc.) and utility software (library, sort, merge, etc.).

> **Application software is** used to carry out specific tasks. This category includes general purpose software such as word processing, spreadsheet, accounting and statistical analysis packages as well as software designed for use in specific fields such as credit card and instalment loan accounting software used in the banking field, actuarial accounting software used in the insurance field, computer aided design software used in the engineering and architectural fields, reservation management software used in the hotel management field and tutorial software used in the education field.
>
> A **software package** is a program (or set of programs) and associated documentation useful to many users and which can be used without modification on defined computer systems (i.e. with specific hardware and embedded software). The buyer is licensed to use the software, but cannot copy it or modify it without the permission and usually the involvement of the developer. In contrast, custom software is developed for and to meet the needs of a particular user. The buyer may nor may not retain exclusive rights to the software.

Discerning between the kinds of software listed above is not always easy. There may be custom system software or custom standard software. However, in practice the distinction is intuitively clear.

Some types of software certainly have investment properties: a specific program or software system may be used for several years and it may yield an economic benefit to its user. On the other hand, not all software may be considered as an investment: a program to be used for one small task could be compared to an office aid and accounted for as an operational cost.

System software is software designed to control the basic functions of digital equipment; e.g. in case of an office computer i/o, file handling and communication. In general, it is supplied to the user as a package incorporated in the purchased equipment. In practice it will be considered as a part of the equipment and the price of the (tangible) investment includes system software. Although some system software is also available as a separate product, it should be considered a tangible investment.

Tools software is software used to produce software. It includes database management and program-generating systems and is generally purchased from a third party, most likely a computer service firm. The problem with this kind of software is, that in many cases it will not be sold to the purchaser, but supplied under some kind of licensing agreement, which often includes a certain amount of maintenance and support.

This licence agreement is comparable to operational lease. The treatment of leases has aroused some discussion over the last decade.[8] Although the arguments in favour of classifying leases as investments are legitimate in a certain setting, given the definition of intangible investment licence contracts should nevertheless theoretically be left out. In practice poor data availability will prevent this procedure. It is proposed to treat the associated licence payments as investments.

Application software comprises systems with a closely defined purpose such as word-processing, spreadsheets, software for administrative, commercial and industrial management, etc. In general, standard application software will be purchased from a third party. Custom software may be produced either in-house or by a third party. In case of software produced by a third party, the same points apply as for tools software: both lump sum and licence payments occur. As with tools software, it is proposed to include the licence payment as an investment.

From a theoretical point of view, installation of a new release of a software program should be considered maintenance when minor changes have been implemented in respect of the current release. New releases with major improvements should be classified as an investment. Most likely, this information will be lacking and it is proposed to count acquisition costs for all new releases as an investment.

Although a large part of software expenditure relates to "office aid" types of software, industrial application of digital software is rapidly growing (robots, computer-aided manufacturing). In line with the contemporary practice in this field, this kind of software should be considered as system software; in most cases it is an integral part of a tangible investment.

Software systems produced by own computer personnel should be valued at the costs incurred: direct labour and materials costs plus overhead depreciation, etc., *cf.* R&D and training. In the Netherlands this category accounted for almost half of the total software costs. Again, in theory not all software development in this field should be treated as an investment; many in-house produced programs have a very short life-span.

> In summary, data on software should include the acquisition costs for purchased software, both packaged and customised. Licence payments should be included. Furthermore, the costs for in-house production of software must be accounted for, at least the direct labour costs involved. Costs for system software should be excluded.

There are several adjoining or even overlapping fields between software and R&D and training. The *Frascati Manual* (OECD, 1994) devotes an entire section to the treatment of software development (Section 2.3.3.2.4). This section tries to specify the R&D component of software development in detail, but still a lot is trusted to be done by the respondent. Overlap between software costs and R&D may be substantial: in 1988, almost a quarter of total Canadian business R&D related to software development (Statistics Canada, 1990).

> Costs of software development labelled R&D should be accounted for in the R&D statistics, and should therefore to be excluded from the software figures.

This distinction is hard to establish without very detailed software statistics or a specific question on software R&D in the R&D statistics.

The introduction of large software systems, being similar to the installation of new machines and equipment, is often accompanied by a training programme; new software requires new skills and new working procedures. In some cases this initial training support is included in the price of the software giving rise to a possible source for double counting with training figures, which is inevitable in the absence of very detailed statistics.

In some OECD countries accounting rules allow firms to activate certain software costs, but this procedure is not very widespread in practice. Additionally, there is no term to identify software costs in the profit and loss account. In most countries, software costs are generally within an item comprising computer costs in general.

Data on software investment is hard to come by. In almost all cases it refers to production of the software engineering sector or to sales of software. In the Netherlands an elaborate automation survey provides details about both the acquisition costs of software from outside the firm and the costs for own software development personnel. In Finland the software data of the special intangibles survey relate to costs of software acquisition from outside the enterprise or developed internally. The latter should not be a part of a research project (which is R&D). Unlike the Dutch survey, only costs for software with a useful life of at least a year are taken into account.

The country reports yield a hazy picture of the importance of software investment. In France software accounts for about 25 to 30 per cent of the total intangible investment, while in Norway software investment appears to be negligible. This huge variation indicates that a considerable amount of work is needed to harmonize the definitions and coverage.

3.4 Marketing

The heading "marketing" covers a great variety of activities. A general definition (Kaplan, 1987) could be:

> The range of co-ordinated actions performed to position and develop the sales of a product or a service.

The following activities involve marketing:

- market introduction (market research, design, etc.);
- sales (e.g. services);
- advertising (advertisements, sponsoring, (promotion, public relations, etc.);
- logistics (storage, transport, etc.).

It is evident that part of the expenses associated with these activities has an investment character. For example, market research creates knowledge about consumers' preferences, from which the enterprise

might benefit for a long time. On the other hand, there are severe problems in strictly defining which (part of an) outlay should be considered as an investment and which (part) is an operational cost.

Even when attention is focused on the outlays for long-term marketing, such as in the Finnish intangibles survey, problems of demarcation remain. Do recurrent promotional activities such as weekly advertisements, aimed at generalising knowledge of the firm's name and its image, contribute to the assets of that firm (*cf.* upgrading of machinery) or are they more similar to the maintenance of equipment?

In view of the wide field of marketing-related activities, some practical indistinctness will be inevitable. In order to avoid total confusion about coverage of marketing data:

> It is recommended to concentrate on market research and advertising, at least initially.

Observational problems and conceptual obscurity concerning marketing aspects of design, the sales process and logistics prevent them from being included in core statistics on intangible investment.

> Market research is the systematic collection, analysis and interpretation of information concerning identification and solutions of marketing problems.

It is a management tool, in support of marketing decisions. It clearly has investment aspects.

Outlays for market research comprise expenses for investigations of an explorative, descriptive and normative nature, both by external consultants and by the firm's own employees. This research may be based on own observations, e.g. through surveys and panels (primary data collection), or on existing data sources (secondary collection of information).

> The heading "advertising" comprises expenses for advertisements in papers, magazines, etc., radio, TV, and cinema commercials, direct mail, outdoor advertisements (billboards, air publicity, etc.), sponsoring and the like.

Additionally, costs for items such as presents for business relations, catalogues and exhibitions should be included. Apart from outlays for the actual advertising, expenditure for assistance of external publicity agencies and the costs related to the in-house publicity division should be recorded.

There is little conceptual overlap between marketing and other components of intangible investment. The *Frascati Manual* (OECD, 1994) explicitly excludes marketing activities (e.g. for the introduction of an innovation) from R&D activities. Training of in-house marketing staff may partially be observed both as a training expense and as a marketing outlay. The same applies to software costs on behalf of a marketing department. Most likely, the volume of this double counting will be modest.

In many countries outlays for advertisements, etc., are reported separately in company accounts, at least expenses for external consultancy and assistance. This source has been exploited both in the Netherlands and in France. However, no distinction is made between strategic or long-term and merely operational advertisement.

International data is supplied by branch organisations such as The Advertising Association (EAAA) and *Services Postaux Européens* (SPE). In both cases, figures are obtained from the supply-side: publishers/printing firms, direct mail firms, advertising firms, etc. Comparisons between countries is hampered by differences in coverage, definitions, currency fluctuations and the like. Figures should be considered tentative and conclusions concerning the absolute differences between countries might be deceptive. No provision is made for a distinction between investment and current costs.

As has been noted in one of the preceding paragraphs, the demarcation of advertising outlays with and without an investment characteristic is very difficult. In view of the available sources, it is proposed to include all advertising costs. However, as intangible investment statistics mature over the course of time, an effort should be made to confine the data to investments. This would require a special set of questions establishing, for instance, the proportion of the advertising outlays related to investment objectives. The Swedish and Finnish approach could be of help here. Another distinction could be between advertising which promotes the image of a firm as a whole, advertising for a group of related products and advertising for a specific product.

3.5 Rights

The heading "rights" sums up a number of transactions relating to the (eventually transferable) right to multiply intellectual products (copyright, both for writing and music), to display or present (film or music rights) or to use in the production process. Rights to exercise an economic activity, e.g. concessions for the exploration of mineral sources or the production of milk (milk quota), are included.

Investment in rights may be a substantial part of total investment. In the Netherlands for instance, in the period 1988-90 outlays for the acquisition of milk quotas total up to Gld 550 million per year, which came to at least 20 per cent of the total investments of dairy farms (Van Bruchem, 1992).

The contents of the term "rights" is heterogeneous. In some cases the right relates to the amount paid to acquire the possibility to use a certain invention or intellectual product. The magnitude of the sum paid does not depend on the intensity of the use of the service.

The first example of this kind of rights are patents and brands. Others include the right to translate a book and sell it on the home market or the right to record or release the work of a certain composer. This construction is also in use with licences or allowances for the use of patented production processes. In all these cases the amount paid to obtain the right clearly represents an investment to the purchaser.

On the other hand, the term "rights" is used to indicate the amount the user of a service has to pay for every instance the service is made use of. A clear example of this is the music right, but this method is also used for licensing industrial property rights.

In this case the receiving party is not an investor. For instance, the payment by a farmer of a fee for the seed he uses is intended to reimburse the plant-breeding company that produced the specific variety. It indicates an investment by the plant breeder, but for the farmer the seed is only a current cost. The same applies to licensing: the service is analogous with a normal auxiliary good and must be regarded as operating expenditure.

In practice a mixture of both methods may be used, e.g. with licensing, where a lump sum payment plus a payment per article produced may be agreed. A boundary case is a long-term contract, arranging a payment per article produced.

Table 2 may prove helpful in deciding whether the costs of a right should be classified as an investment. Costs for patents, concessions and brands and payments for the acquisition of the right to translate, produce, record and release books, music and films are investments to the firm that makes the expenditure. Licensing is a difficult story. Part of the licence payments is comparable to operational lease or rent and should be accounted as a current cost. Long-term agreements and lump-sum payments are an investment.

Table 2. Treatment of rights

Kind of right	To be considered investment?[1]	What expenses form the investment?
Patent	Yes	Acquisition cost, both for patenting an invention and for the purchase of a patent from another firm.
Copyright		
-- writing	Yes	Acquisition costs of the right to publish or translate
Music right		
-- acquisition work	Yes	Acquisition costs of the right to record or release music
-- play	No	
Film right		
-- acquisition work	Yes	Acquisition costs of the right to put, e.g. a play or a novel on the screen
-- display	No	
Licence	Partly	Only lump-sum payments for acquisition of a licence and costs of long-term agreements
Concession	Yes	Acquisition costs
Brand	Yes	Acquisition costs

1. The right forms an asset for the firm and may contribute to production for several years.

Obtaining data on the cost of acquiring rights proves to be troublesome. In many cases no reliable source exists (e.g. for costs for initial patenting, registration of brands) or data is polluted by elements that should be excluded (e.g. music rights and licences). Furthermore, except for international trade in licences, which is part of the Technology Balance of Payments (OECD, 1990), no acceptable international data source is available.

Moreover, there are several areas of overlap between rights and other components mentioned. Software, for instance, is increasingly supplied under licensing contracts. Because of the conceptual and observational difficulties pertaining to costs of rights, data should be used (and produced?) with some care.

Of all the countries that produced statistics on intangible investment, only France, the Netherlands and the United Kingdom reported on costs of rights. The French and the United Kingdom studies surveyed only the purchase of patents and licences, while the Dutch report includes costs for copyrights. Licensing costs proved to account for the greater part of total investment in rights (more than two-thirds in the Netherlands).

3.6 Mineral exploration

Mineral exploration can be described as:

> The search for new deposits, e.g. by mining and oil companies results in knowledge about the whereabouts of these deposits, enabling these firms to exploit them, either by own production firms or through concessions.

Using a similar reasoning as applied to R&D, costs incurred in this search can be considered an investment.

In principle, data on mineral prospecting is readily available from mining companies. Definitions of the costs included are fairly straightforward. Mineral exploration is proposed to be treated as an investment in the SNA 1993 (CEC *et al*., 1994) (see also Blades, 1989). To date, however, no country has produced separate data concerning this subject in their studies of intangibles. In the *Frascati Manual*, mining and prospecting are excluded from R&D, except for some minor topics, so no serious overlap occurs.

3.7 Other possible components of intangible investment

3.7.1 Development of the organisation

> This topic comprises a variety of expenditure categories, ranging from management consultancy fees through reorganisation costs to costs of internal audit teams.

Some of these activities may produce an asset, e.g. an organisation structure that stimulates communication or innovation.

Specialised firms form part of ISIC activity 741 (more specifically, activity 7414: Business and management consultancy activities) and for countries that produce statistics on this item, this could be a source. Problems relate to the fact that:

- clear demarcation of the relevant activities is lacking;
- establishing the components that create an asset is difficult;
- lack of specialisation of the relevant firms and the amount of in-house work incurred makes observation very difficult.

The Dutch report included some data supplied by an association of management consultancy firms.

3.7.2 Engineering and design

> The heading "engineering and design" consists of drafting work, defining operating instructions, process and prototype development, etc.

It should be noted that defining "engineering and design" is a difficult task and, in line with the preceding paper, it is proposed that they should not be included in standard measures of intangible investment, for the following reasons:

- a significant part of engineering and design forms an integrated part of a tangible asset, e.g. drawing for construction work (buildings, etc.) or machinery, and its costs are included in the price of that asset;
- according to the *Frascati Manual*, engineering and design related to R&D (e.g. initial prototyping) are considered as R&D;
- establishing the components that form an asset is difficult;
- the amount of in-house work incurred makes observation very difficult.

3.7.3 Other components

The other components mentioned in Section 2.2 (development or access to data banks, remuneration of innovative ideas, human resources development, etc.) are less well defined than the items discussed in the preceding sections. In addition, the quantitative effect of these components is expected to be small. Nevertheless, the Finnish survey shows that these items have a certain impact in that they were reported by up to one-third of the reporting units. The Finnish approach of collecting qualitative information, is to be considered for all “other components”.

CHAPTER 4. DISSEMINATION OF RESULTS

4.1 General aspects

An important feature of the production of statistics is finding the appropriate form of publication. The manner in which a set of data is published can have a decisive effect on its use. With a fairly unknown and conceptually new product, special care should be taken to obtain access to as large an audience as possible.

Furthermore, given the practical difficulties of producing statistics on intangible investment, the publication scheme should be as flexible as possible. This enables the various statistical bodies to disseminate their data without it impeding users from performing their own analysis.

It is, therefore, in the first place recommended to disseminate the data in as much detail as possible, so that users can compile the indicators they need.

Furthermore, comparisons can greatly benefit from a solid description of coverage in terms of industries, size classes (cut-off samples), etc. Once an Intangible Investment Manual is in operation, deviations from the recommended methods and definitions should be indicated.

Ideally, the statistician should adjust for incomplete coverage of the survey, using some suitable method. However, even the OECD database on R&D expenditures contains unmodified data from cut-off surveys, e.g. pertaining in some countries to only firms of 50 employees and over. Of course, differences in coverage cause more trouble in comparing totals than in comparing trends over time.

4.2 Conversion for currency differences and price movements

For international and intertemporal comparisons, investment figures in nominal national currency do not suffice. Currency differences and price movements prevent reliable analysis. In consequence, investment data should undergo several conversions.

4.2.1 Currency differences

Currency variations can be dealt with in three ways. The first possibility is to use a specific national currency, generally the US dollar, as a common unit of account. It is proposed initially to use a yearly average of the observed market rate as the exchange rate for conversion. This method takes into account the fluctuations shown by market rates. However, wide swings in market rates may undermine the reliability of cross-country comparisons based on even annual averages. The possibility of making comparisons using purchasing power parities should also be explored.

The third method is to scale data on intangible investment with other data in national currency, for example in percentage form. Appropriate variables for this conversion are production and tangible investment.

Data on production and tangible investment may be obtained from National Accounts, i.e. Gross Domestic Product (GDP) and Gross Fixed Capital Formation (GFCF). Preferably harmonized data, e.g. OECD National Accounts, should be used. Because figures on intangible investment only apply to the Business Enterprise Sector, GDP and investment data must also relate to this sector. It should be noted that strictly speaking, the alternative definition of investment implies a correction of GDP. Because of practical problems related to the computation of depreciation of intangible assets, it is proposed to compare intangible investment with official GDP estimates.

A breakdown of these figures by industry or size class in most cases will have to be established using specific investment statistics; national accounts data is not available at this level of detail.

4.2.2 Price movements

The use of current price data prevents useful intertemporal comparisons, because of the impact of price movements on this kind of data. Two methods may be used to adjust for price movements.

The first method has been described in Section 4.1: conversion of values into percentages. This method was used in several intangible investment studies. Implicitly, however, this method assumes that price movements of intangible investment (numerator) matche that of the denominator (GDP or GFCF). In general, price movements of GDP and GFCF are not the same, at least not in the short term. This implies that at least one of the two percentages still contains a price component.

The alternative is explicit deflation of the intangible investments. For R&D, the *Frascati Manual* prescribes a method, weighting individual price indices for personnel, material, land and buildings, machines and equipment. This method could be used for all components of intangible investment. In practice price movements will be dominated by trends in labour costs.

Construction of price indices for services, however, is a complex and difficult task. There is a host of literature on both theoretical and practical problems in this field.[9] For the core components of intangible investment, most likely the greatest problems are raised by the software data, notably because quality improvements in this service are hard to measure.

Of the five studies (excluding the United Kingdom), none presented deflated figures. In the Netherlands some research in this field is underway (Pronk and Wecker, 1993). For R&D and licences, the deflator recommended by the *Frascati Manual* was used. For the other core components, deflators were derived from the OECD's STAN database for the Netherlands (Van der Hoeven, Van Leeuwen and Zijmans, 1993), which contains separate output deflators for 35 industries for the period 1972-88. For marketing and software the deflator for ISIC 45 "real estate and other business" and for training that for ISIC 46 "social and personal services" was used. Of course, these ISIC groups are "polluted" with other industries than those we are interested in, but the STAN database is one of the only sources for international comparable deflators. The impact of deflation appeared to be enormous.

4.3 Publication scheme

In summary, it is proposed to publish (components of) intangible investment primarily in national currency. Furthermore, they should be published in US dollars, in PPPs and as a percentage of both GDP and GFCF. The last three variables enable cross-country comparisons and give a good impression of the magnitude of intangible investment in relation to other macroeconomic variables. To provide information on the intangibles intensity of production (in analogy with capital intensity), intangible investment per employee is added.

The following publication is suggested:

	Total Business Enterprise Sector
Of which	
	Manufacturing
	Billion national currency
	Billion US dollars
	Billion PPPs
	% of relevant GDP
	% of relevant GFCF
	Per employee
Total intangible investment	
"Core" components	
of which: R&D	
	Training
	Marketing
	Software
	Rights
	Mineral exploration
Other intangible investment	
of which: ...	
	...

This scheme covers the core components and additions are optional. Separate publication of data for manufacturing is proposed because of the importance of this sector. In the Netherlands it accounted for about 55 per cent of the total intangible investment. Further breakdown by industry, size class, etc., is optional.

Unfortunately, the available material concerning the current studies on intangible investment do not fit into this scheme because of differences in coverage, etc.[10] However, the published data is summarised in the first paper in Part II of this compendium.

CHAPTER 5. SOME COMMENTS ON MEASURING STOCKS OF INTANGIBLE CAPITAL AND DEPRECIATION

Investment in intangible assets by definition leads to intangible capital, long-lived rights or assets without a physical substance, with future economic benefits which the enterprise is able to control. Investment only represents the inflow of capital into the stock of intangibles.

To complete the coverage of the topic of intangible assets, data for the stock itself is needed. In the first place it is required as an input to economic models in production functions, e.g. capital stock estimates are used to analyse productivity changes.

Furthermore, stock figures are, for instance, used in the National Accounts to estimate yearly depreciation as a measure of capital consumption related to the production of that year.

In the national studies on intangible investment, no attempts were made to estimate the stock of intangibles, indicating the problems faced in establishing such a figure.

Determination of stocks of capital can be achieved using two methods. In the first one it is established by using direct observation. In the Netherlands, employees of the Central Bureau of Statistics visit enterprises and make a full description of the capital in operation. Topics recorded comprise type (at least ten different items) and age (in classes). Using some valuation method, the total value of the capital stock may be calculated (Berends-Balast, 1987).

Although this method is preferable on theoretical grounds, it suffers from several handicaps. In the first place, the method is very labour-intensive. For this reason not all firms in the Netherlands are visited, and additional estimation techniques are used. Furthermore, valuation of used machinery and equipment poses serious problems (no comparable machines to obtain market values from, ageing, etc.).

For intangible assets, this method is not applicable as direct observation of the stock of intangibles is impossible. An indirect method must be used instead.

For stocks of tangible capital, some form of the Perpetual Inventory Method (PIM) (Goldsmith, 1951) is used in most cases. This method uses annual investment data and information about the lifetime of assets and their scrapping scheme to compute capital stock data. Deflation of investments is a prerequisite of PIM. If possible, calculations are carried out per type of investment (buildings, equipment, computers, etc.) by taking the distinct lifetime of these assets into account.

PIM could be used for intangibles as well but, first, it requires information about the lifetime of intangible assets. This leads to serious questions. Strictly speaking, some elements of knowledge have an infinite lifetime and should therefore never lead to disinvestment, at least at a high level of aggregation. Based on this reasoning, Kendrick used no depreciation scheme for basic research (Kendrick, 1976).

At the enterprise level, however, even knowledge will have a finite lifetime. Bos *et al.* (1992) suggest using expert knowledge, common practice in the business accounts, dates of expiration of patents,

etc., to estimate this lifetime. It is recommended to follow the first line to use expert information and apply them for different kinds of intangibles, analogue to common practice with tangible assets.

Secondly, before investment data can be used as an input to PIM, it has to be converted into constant prices, for which some method of deflation will be required. The problems concerned have been discussed in Chapter 4.

Finally, a suitable scrapping scheme has to be chosen. Various schemes are available: rectangular, straight-line, some statistical density function (normal, gamma density, etc.). It is proposed to use a simple straight-line scrapping scheme for all components.

If a long time series is available, PIM might be used to compute the value of the stock of intangibles. However, the results are to some extent dependent on the initial premises made. Therefore, any work in this field is welcomed but results are to be regarded as experimental.

When a capital stock estimate is established, depreciation data may be compiled using some acceptable method. Depreciation figures depend heavily on the PIM-based stock data and, of course, the quality of depreciation figures will not exceed that of the stock estimates.

Statistics at a more detailed level (e.g. branch of industry or even firm) pose further problems because part of the intangible assets of a firm is incorporated in employees, e.g. knowledge, skills. Job mobility in this case leads to a certain amount of disinvestment by the firm that trained a leaving employee. In theory, this also applies to data at the national level in case of a so-called "brain drain" to another country.

NOTES

1. These observation problems with services are widespread within the statistical field: the Voorburg Group was established, among other things, to contribute to the improvement of observation of service statistics.

2. There was substantial discussion about the investment character of R&D during the revision of the SNA. The final outcome is, that in the core SNA the current treatment is sustained: R&D outlays are a current cost. In satellite accounts, however, R&D may be considered an investment.

3. In the Netherlands tangible investment normally represents about 10 per cent of total business R&D expenditures. In the late 1980s, this figure rose to 20 per cent, resulting in a record high business R&D intensity in 1987. Using calculated depreciation on tangible assets instead of realised investment, the corresponding business R&D intensity level dropped by 10 to 15 per cent. See Nieuwenhuijsen and Vosselman (1993).

4. This definition is drawn from the definition currently discussed in a Eurostat Task Force on Continuing Vocational Training.

5. Definition of a training programme used in the Dutch 1990 survey on Company Training.

6. An OECD Expert Group on Training Statistics in 1991 reviewed the national training surveys and presented suggestions on how training statistics might be improved, while Eurostat is working on a community-wide training survey using a harmonized questionnaire. See also Paper 10 of this compendium.

7. Classification of software systems used in the Dutch special survey on software (1990-92).

8. The decision whether or not to include operational lease as an investment depends on the point of view selected. From a production capacity point of view, a building held in possession and one leased are completely similar goods, which pleads in favour of treatment as an investment. In the Netherlands this procedure was adopted in the regular investment statistics. On the other hand, financially, lease and investment are to be treated completely differently. Lease of a good, unlike investment, does not create an asset. Furthermore, the investing firm carries the total financial risk of a investment; lease of a good implies a much smaller risk. For that reason, in the SNA, lease is considered a service.

9. Reference is made to the papers of the Voorburg Group.

10. Comparable data may be available within the relevant statistical bodies, but the six national studies differ in many points, as can be seen from the Paper 5 of this compendium.

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