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in National Accounting

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On the Treatment of Intangible Assets in National Accounting

Itsuo Sakuma

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2. Popper's Three Worlds
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Abstract

The purpose of this paper is to give some suggestions on the treatment of intangible assets in national accounting. Knowledge ("World 3" in Karl Popper's term) is a sort of environment for human beings. As people more and more come to think that knowledge is an important factor for economic growth, the society comes to believe knowledge is capital. However, it is not easy to treat knowledge as capital.

First of all, it is because knowledge creation is not economic production. In this paper, it is proposed that knowledge access should be focused instead. In addition, by drawing attention to striking similarities between expenditures for certain intangible fixed assets and certain work-in-progress-type expenditures, it is suggested that the concept of intangible fixed assets in the 1993SNA may be better interpreted when you consider them as a special type of work-in-progress. Finally, the treatment of intangible non-produced assets is discussed. (149 words)

1. Introduction

Knowledge is a sort of environment for human beings. Like the environment in its ordinary sense, it is an essential prerequisite for production as well as consumption. Not only that, economic activities may transform the knowledge environment just as economic activities may change the natural environment. As it is often said that the natural environment must be placed under conscious control of the society in order for sustainable development to be attained, and as people more and more come to think that knowledge is an important factor for economic growth, it is quite natural to think that knowledge as well should be placed under conscious control of the society and by doing so, it may be expected that economic growth will be accelerated.

In contrast to the recognition shown above that knowledge is environment, businesspersons more and more come to think knowledge is capital of a sort, the accumulation of which, they believe, is an essential factor for productivity growth and profitability as revealed in the following citation: "R & D expenditures contribute significantly to the productivity (value added) and output of the firms, and the estimated rates of return on R & D investment are quite high --as much as 20-35 percent annually-- with the estimates varying widely across industries and over time." ¹. This recognition is somewhat similar to but not equivalent to the statement above that knowledge should be placed under conscious control of the society.

However, of course, knowledge cannot so easily be treated like ordinary capital assets. In fact, according to current business accounting practices, most R & D expenditures are not regarded as assets. A typical explanation is that it is because of uncertainties involved including the possibility of spill-over. But it is also true that business accounting views are changing towards a wider recognition of so-called "intangibles." On the other hand, national accountants look keener to include intangible items into their list of fixed assets.

In this paper, some suggestions on the treatment of intangible assets and related matters will be given. After introducing Karl Popper's famous concept of "World 3" in the section following this introduction, it will be stressed that to have access to the World 3 is essential to any economic activity. An economy's or a firm's accessibility to the World 3 --what part of it is available for them -- may affect its productivity among other things.

People or organisations make more than a little effort to get access to the World 3. For example, people are keen to be better educated. Organisations are ready to spend not a little money on R & D as well as training of employees. These activities need much time spent by people as well as intermediate and primary inputs such as school teachers' labour input. Moreover, the tangible objects which contain information, such as books, magazines, newspapers, films, photos, music scores, and records of clients, etc. as well as capital stock in the ordinary sense like school buildings are used in activities to acquire or maintain the access to the World 3.

¹ Lev (2001), p.55.

However, it might be worth noting that knowledge access may be obtained through various ways including rather not so typical market transactions like headhunting (employing other company's professional staff), a certain kind of contracts as well as M&A because the access may be embodied in labour input or so called human capital. In addition, organisations may have the knowledge that is not easily accessed from outside. Accounting for knowledge access is necessary and clearly it is somewhat different from accounting for R & D.²

In addition, it should be understood that knowledge access may be blocked or at least made unusable for production purposes by, say, patent holders. Thus, some legal rights (typical intangibles) give the right holder ability to block the use of certain knowledge in the production processes controlled by the firms that do not pay royalties. At least in a short run, clearly such legal rights make the production possibility set of the economy smaller and this might have implications on people's well being like in the case of certain drug patents. The very fact gives the rights economic value. Clearly, policy considerations are necessary about whether such legal rights should be given at all or if so, how. National accounts statistics must provide policy makers with information needed for such decision. It should be recognised that the kind of information that national accountants should offer is sometimes totally different from what business accountants think they should offer.

Also in the section, the treatment of "intangible fixed assets" in the 93SNA such as computer software, mineral exploration, entertainment, literary or artistic originals and so on will be discussed.³ Although it is claimed in the 93SNA that they are produced assets, that is, outputs of some productive activities, it may be asked what kind of production is done behind those assets. Our view will be shown below. In short, it may be called a work-in-progress view of intangible fixed assets. That is, it is suggested that the concept of intangible fixed assets in the 93SNA might be better understood or interpreted when you look at them as a special type of work-in-progress.

In the next section, some topics on patents and other similar intangible assets will be taken up. In the 68SNA, they are called "intangible assets, not elsewhere classified" or "intangible assets except claims." However, in the 93SNA, they have come to be called intangible non-produced assets. Although it seems that this change reflects the increasing importance of "intangibles," the new naming is not necessarily good for those who are familiar with the 68SNA's terminology because typical intangible assets such as patents and copyrights as well as typical financial assets are both non-produced and intangible.

The problem of goodwill will be addressed as an illustration of the above mentioned differences in viewpoints between business and national accounting. Thus, it will be shown that goodwill should not be considered to be one of the asset categories in national accounting although it appears among the asset categories in business accounting.

Some concluding remarks will be given to close the paper.

² See OECD (2002) for a typical example of the accounting for R & D.

³ In the ongoing minor revision to the 93SNA, "intangible fixed assets" are renamed as "intellectual property products." Because it will be shown below that this should be considered to be an unsound change, we stick to the old name.

2. Popper's three worlds

Let us start by introducing this famous term of Karl Popper's to facilitate the discussion in what follows. According to Popper (1979, 1994), the world 1 is the world of physical states and processes and the world 2 is the world of mental states and processes. The world 3 is the world of the products of human minds, more specifically problems, theories, discussions as well as architecture, art, literature, music. Although his focus is naturally on science (and scholarship), his comments on artistic and literary works are very interesting from the viewpoint of national accounting.

“By ‘world 3’ I mean, roughly, the world of the products of our human minds. These products are sometimes physical things such as the sculptures, paintings, drawings, and buildings of Michelangelo. These are physical things, but they are a very peculiar kind of physical things: in my terminology they belong to both the worlds 1 and 3. Some or other products of our minds are not precisely physical things.”

“Take a play by Shakespeare. You may say that the written or printed book is a physical thing like, say a drawing. But the performed play is clearly not a physical thing, though perhaps it may be said to be a highly complex sequences of physical events. But now please remember that no single performance of *Hamlet* can be said to be identical with Shakespeare's *Hamlet* itself. Nor is Shakespeare's play the class or set of all of its performances. The play may be said to be represented or reproduced by these performances, in a way similar to that in which a building or a sculpture may be said to be represented by one or several photographs, or in which a painting or a drawing may be said to be reproduced by prints of varying quality. But the original painting itself is different from its reproduction. And in a somewhat similar way, Shakespeare's *Hamlet* clearly is not. Although its reproductions may be said to belong both to the world 1 of physical things and to the world 3 of products of human mind, the play, *Hamlet* itself, belongs only to the third world.”

“It is similar with a symphony. The written score of Mozart's Symphony in G Minor is not Mozart's symphony, although it represents Mozart's symphony in a coded form. And the various performances of Mozart's Symphony in G Minor are also not Mozart's symphony: they stand to the symphony in the relation of reproductions. These performances simultaneously belong to both world 1 and world 3. But the symphony itself belongs only to the third world – that third world which comprises architecture, art, literature, music and – perhaps most important – science and scholarship.”⁴

It may be mentioned that in the 68SNA, sculptures and paintings as purchased by producers except own house occupiers as well as Michelangelo's buildings are fixed capital formation while in the 93SNA, sculptures and paintings have been reclassified as valuables the new, third category of capital formation. On the other hand, authoring a book (like *Hamlet*) and composing a piece of music (Symphony in G Minor) are outside the production boundary of the 68SNA, while in the 93SNA, they have come to be regarded as entertainment, literary or artistic originals one out of four categories of “intangible fixed assets” in the 93SNA. It will not be difficult to find a striking correspondence between Popper's assignment and national accounting practices.

The relation between Shakespeare's *Hamlet* and its performances or that between Mozart's symphony and its performances is somewhat like the relation between

⁴ Popper (1994), pp.5-6.

a building’s plan and the building itself or that between the signifiers and the signified⁵ in the theory of semiotics. Of course, there may be a variety of performances of *Hamlet* or Mozart’s symphony. In the case of sculptures and paintings, clearly the physical objects belong to the World 1. Sculptors and painters as well have had their plans for the works. But, it is the physical objects themselves that should be deemed to be “authentic” in these cases. It is worth noting that it is a common fact that plans or designs exist for any human products. These plans belong to the World 3, so in that sense, any physical product belongs to both World 1 and World 3.

It may be worth noting that in the case of the work of art which Popper assigns to the World 3 only, the signifiers, or more correctly, the media carrying them are found in the world of physical objects.

Table 1.1 below shows the treatment of selected work of art items in the 68SNA and the 93SNA and their “residence” in Popper’s three Worlds.⁶

Table 1.1 The Treatment of Selected Work of Art Items and Popper’s view

Items	68SNA	93SNA	Residence in Popper’s three Worlds
Sculpture	Fixed Capital Formation if purchased by producers	Valuables	World 1 and World 3
Paintings	Fixed Capital Formation if purchased by producers	Valuables	World 1 and World 3
Literary works	Outside of production boundary	Originals should be treated as Intangible Fixed Capital Formation	World 3
Music composing	Outside of production boundary	Originals should be treated as Intangible Fixed Capital Formation	World 3
Music Performances	Services; Intermediate or Final Consumption	Master tapes, etc. should be treated as Intangible Fixed Capital Formation	World 1 and World 3

⁵ According to the well known (Saussurean) two-part model of the sign, a signifier (*signifiant*) is the form which the sign takes; and the signified (*signifié*) is the concept it represents. See Eco (1976) for example.

⁶ Some of the items are what will appear later in this paper. Correspondence between the treatment in national accounting and residence in Popper’s worlds is quite clear.

In passing, you can understand better the 68SNA's treatment of sculptures and paintings in the Table above if you consider that they are furniture of a kind placed in buildings. It may be interesting to note this treatment is consistent with the philosophy behind the Bauhaus movement (1919-33) in that Walter Gropius, the founder of Bauhaus wrote in the Manifesto: "The ultimate aim of all creative activity is a building! The decoration of buildings was once the noblest function of fine arts, and fine arts were indispensable to great architecture. Today they exist in complacent isolation (...the rest is omitted.)."

About the role of the World 2, it is worthwhile to note that World 2's main function is, according to him, to produce World 3 objects, and to be acted upon by World 3 objects and that it interacts not only with World 1, as in Cartesian body-mind problem, but also with World 3. Thus, the World 2 is thought to function as intermediary. Here, we introduce "objective knowledge" and "subjective knowledge," two of the well known terms of Popper's. Let us compare the following two expressions:

It is well known that water consists of hydrogen and oxygen;

He knew that water is composed of hydrogen and oxygen.

The former refers to knowledge in objective sense or objective knowledge, while the latter refers to knowledge in subjective sense or subjective knowledge. Objective knowledge belongs to the World 3, while subjective knowledge belongs to the World 2 and as seen from the above comparison, "an important part of subjective knowledge is objective knowledge taken over by some subject." But, he described: "the largest part of subjective knowledge consists in inborn potentialities: in disposition, or in modification of inborn dispositions." ⁷ Thus, that part of subjective knowledge is described as consisting of dispositions, inborn or acquired, to react in certain ways to certain situations.

He takes up an important example of acquired dispositions: language. "For example, speaking English or French is an acquired disposition. But the basis -the disposition to learn some human language- is an inborn characteristic of the human species alone."⁸ "Once they have learned a language, they can, as it were, plug into the third world."⁹

One of the most important characteristics of the World 3 is its autonomy. ¹⁰ He takes an example of "prime numbers." "The Babylonians were the first, so far as we know, who designed a number system." "You probably know what prime numbers are – numbers that are not divisible except by themselves and by the number 1. So, 2, 3, 5, 7, 11, and 13 and so on are prime numbers. Now, prime numbers not only have not been made by us but are already quite beyond our control in a certain sense. We do not know much about their distribution." "Now this shows that there is something here to be

⁷ Popper (1994), p.13.

⁸ Popper (1994), p.14.

⁹ Popper (1994), p.15.

¹⁰ Despite of its autonomy, unlike Plato's concept of *idea*, the World 3 is, after all, man-made.

discovered. Although the numbers are made by us, there are certain things above them which are not made by us, but which can be discovered by us. And this is what I call the 'autonomy' of world 3."¹¹

This is the very reason why a question arises concerning whether creation of knowledge, or any "output" to the World 3, should be considered to be within the production boundary or not. Suppose a new resident of the World 3 appears. Why can you say it is a result of a particular productive activity? Or simply, it is due to the autonomy of the World 3.

The autonomy apart, as Popper (1979) states, knowledge grows through error elimination by way of systematic rational criticism.¹² The following is his famous schema:

$$P_1 \rightarrow TT \rightarrow EE \rightarrow P_2.$$

“That is, we start from some problem P_1 , proceed to a tentative solution or tentative theory TT , which may be (partly or wholly) mistaken; in any case it will be subject to error-elimination, EE , which may consist of critical discussion or experimental tests; at any rate, new problems P_2 arise from our own creative activity; and these new problems are not in general intentionally created by us, they emerge autonomously from the new relationships which we cannot help bringing into existence with every action, however little we intend to do so.”¹³

For example, some problem-situation, say the increase in autism (P_1), may have caused someone to think that the administration of the combined MMR vaccine which started in the early 1970s in the United States may be the reason for that (TT). The publication of the theory that the MMR vaccination may cause autism was followed by a thorough process of critical discussions. Among them, it was reported that even after the cease of administration in 1993 in Japan due to side-effects of the vaccine, the increase in autism has continued there (EE). It is quite natural that this should make people to rethink about the hypothesis and reformulate the problem (P_2). For example, some people may come to look for the true reason why autism increased.

In this way, the World 3 grows. So, it is not consistent with the view national accountants typically have that economic production is something that is carried out under the control and responsibility of some economic unit.¹⁴

Moreover, “output” to the World 3 or the creation of knowledge lacks reproducibility- so to speak, which should be considered to be an essential property that any meaningful production activity should have. And this seems to be a logical consequence of the assertion in Hill (1977, 1979) known as the “third party criterion”¹⁵ concerning the definition of economic production. In fact, at the outset of Hill (1979, p.31), we find the following: “Do-it-yourself’: the very phrase implies that if you do not do it, someone else do it for you.” Thus, the *possibility* of having other people do the same thing as you do is considered to be an essential condition that any activity should be

¹¹ Popper (1994), p.20.

¹² See p.121 in Popper (1979).

¹³ Popper (1979), p.119.

¹⁴ See paragraph 6.15 in the 93SNA.

¹⁵ Or “third person” criterion, as originally appeared in Hawrylyshyn(1977), p.89.

recognised as economic production. An implication is that intrinsically unique actions cannot be economic production.

Hamlet is a unique, non-reproducible work. Thus, Shakespeare could not have asked someone to write *Hamlet* for him. So, literal application of Hill's principle results in a conclusion that the creation of knowledge cannot be economic production. It is worthwhile to note, on the other hand, that sculptures, paintings or architectural works can be reproducible at least in principle.

Despite this, it seems that the production boundary of the 93SNA runs through the whole three Worlds by introducing the category of intangible fixed assets as is shown in the Figure 1-1 a.

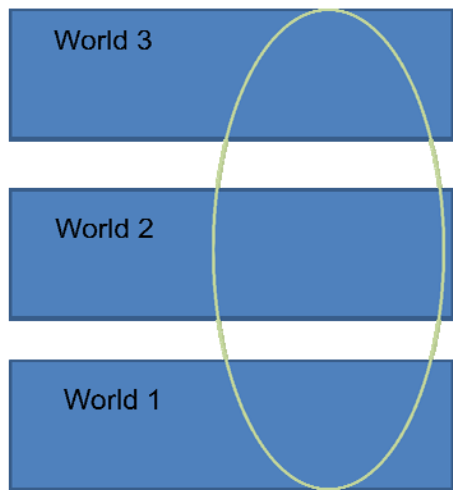


Figure 1-1a

In contrast with the current 93SNA, it is plausible to think that the 68SNA's boundary runs through the World 1 and 2 as in the figure 1-1b below rather than the figure 1-1c because it includes inside the kind of services that cause mental changes in addition to the production of goods and rendering services affecting goods and human bodies.¹⁶

¹⁶ One problem that should be addressed may be about services affecting persons. It may be asked whether you can really cause other persons' mental states. For example, education needs so much effort as well as their capability on the part of people who receive it. Mental changes may be better regarded as a possible outcome rather than the service output. Therefore, at least without taking into account such efforts (including time spent by them, etc.), it cannot be said that the situations involved are fully described.

We would like to propose that the World 2 in addition to the World 3 should be excluded from the description of economic production. The implication is of course that the location of the production boundary should be within the World 1 as in Fig. 1-1c below. One of the reasons for the exclusion of the World 2 from the concept of economic production in general is that economic production is something from "utility" production as utility is a high-profile inmate of the World 2.

However, according to Hill (1977), it is an essential condition for the changes in question to be deemed as services that there is prior consent between the units involved. As "consent" required belongs to the World 2, the services are still defined by using the

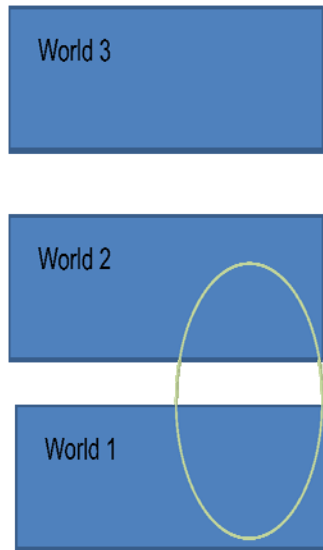


Fig. 1-1 b



Fig.1-1 c

Finally in this section, it may be worthwhile to think about whether the World 3 is shared by the humankind as a whole. Although the World 3 per se is in the public domain, some World 3 objects seem to live only in some restricted area like a particular linguistic area or a so called *nation*. The employees of a company or a particular section of the company may have their particular World 3, to which some efforts are needed to get access from outside the group. Even an employee (for example, a shop attendant) may have her/his personal knowledge that may be useful for the company as well as herself/himself, which has not been “socialised” yet. For example, she /he may know something about her/his customers. The knowledge may be explicit or tacit.¹⁷

So called “knowledge management”¹⁸ tries to mobilise the kind of knowledge that is often likely to be not easily accessible, by socialising it so that it can be shared by a wider group of employees. By doing so, it might be explained in this paper’s context that the autonomy of the World 3 as well as Popperian evolutionary processes can begin to work to help develop their knowledge, skill, etc., further.

3. Access to the World 3

“At any rate, today, people all over the world benefit from the breakthrough discovery of the zero by an unnamed Indian, which he/she never dreamed of. And both then and now, it is seldom heard that self-proclaimed landmark work is truly a landmark achievement.

World 2 if the requirement is to be maintained. If any change is brought about without prior consent required, this should be deemed to be externalities rather than services. One possible way out may be to define a combined category of services and externalities, say “serex” to do the exclusion of the World 2 more completely.

¹⁷ Polanyi, M.(1966).

¹⁸ About “making tacit knowledge explicit,” see Nonaka and Takeuchi (1995).

From Yoichi Yoshida(1898-1989), *The Discovery of the Zero*, first published in 1939.¹⁹

What are the main functions of education? Perhaps, by receiving education, you will be better at calculation. But more importantly, you will come to be able to get access to the World 3 more fully. This leads to the theme of this section: "the access to the World 3."

In this section and the section that follows, we will examine the access to and preclusion from the World 3.

As we noted, knowledge is environment of a sort for us. So, like the environment in the ordinary sense, it is a prerequisite for any production activity. But, if the firm does not have access to particular knowledge, it cannot use it in the production.

For example, even when a certain chemical product is known as an effective drug specific for some disease and the patent for the specific expires, a developing country may not have the access to the technological details about manufacturing them and the specific may not be available in the country. Often generic producers may not be interested in supplying developing countries.

Our proposal is that knowledge access rather than knowledge itself should be focused.

Firstly, as we noted in the previous section, knowledge creation should not be considered to be economic production. Secondly, although knowledge itself is deemed to be in the public domain (the World 3), the access to it may not be freely available. For example, it is a time consuming process for a student to come to understand the relation between the current balance, the net lending, and the saving-investment balance. Thirdly, as we noted earlier, the World 3 includes Popperian knowledge growing processes inside, in which starting problems are raised, then tentative theories are offered and followed by the processes of error eliminations (or critical discussions), and then new problems are addressed. It is relatively easy to say a researcher can participate in the leading-edge discussion (or reaches the most advanced level) in the field, Although it is often said that someone most contributes to a particular theory, in most cases quite a few researchers have contributed in fact. *Knowledge creation is, after all, a cooperative process of human society as a whole. In addition, the process goes along with the help of the autonomy of the World 3.*

Once a person (or a firm) gets access to the leading-edge level of a particular knowledge area, it is a matter of *probability* so to speak whether he/she/it succeeds in inventing something or fails. And, even if he/she/it failed, the experience obtained through the failure may be useful to not only the person/firm engaged in the development process but also other persons/firms possibly.

So, instead of knowledge itself, the access to it is addressed in our accounting model: *Knowledge Access Accounting*. Some basic understandings behind are: (i) knowledge access may be described as the *state* of an economic unit or a group of economic units of which the multi-dimensional distribution measure may be constructed; (ii) human resources are the key to knowledge access as it is accumulated or embodied in them; (iii) in order to maintain or to extend the access, some activities (*access as*

¹⁹ Yoshida(1979), pp.36-37.

activities) must be conducted and they are costly processes which need primary as well as intermediate inputs; (iv) to describe the processes above, it may be necessary to distinguish the capital assets which are mainly used for knowledge access purposes (these assets may be called "access assets") and they include the existing stock of books and similar tangible small-sum items for the knowledge access as well as the main frame computers; (v) knowledge access includes education including staff training as well as R & D as analysing the latter only is like seeing just the tip of the iceberg - so to speak; (vi) in doing so, the time spent by students (at least graduate and undergraduate) for studying should be explicitly taken into account.²⁰

Concerning (i) and (ii), it may be suggested that a matrix (Fields x Levels) the elements of which are the numbers of persons employed who has access to the particular knowledge field/level should represent the knowledge access status data for an establishment/enterprise/geographical area/nation, etc., where fields may be chemistry, physics, econometrics, etc., or more detailed fields, levels may be most advanced, advanced, graduate, etc., so that the knowledge access status data is like that presented in the Table 2-1.²¹

Table 2-1.

Field\Level	Faculty level and equivalent	Graduate level and equivalent	Advanced	Most advanced
Chemistry		*	*	*	*
Physics		*	*	*	*
Econometrics		*	*	*	*
Organisation-specific		*	*	*	*
.....					

Let us assume that a firm *uses* a particular piece of existing knowledge in its production activity. Like the environment in its ordinary sense, the use of any element of knowledge environment is not described explicitly in national accounting. However, the figure below (Fig.2-1a) describes the situation rather explicitly. Knowledge is in the public domain called "Knowledge Environment." The arrows in the figure may be called knowledge flows. If the firm has the access to a particular element of knowledge environment, it can use the particular piece of knowledge in its production as shown in the figure. If not, it cannot use it. Whether it can use or not may be known from its knowledge access status matrix as described above. But even if the firm has the relevant

²⁰ One possibility may be an ad hoc extension of production boundary to take the hours spent by students into account. A possible interpretation may be that the society devolves (using a term in Hill (1977)) part of the cooperative efforts to particular people (students).

²¹ If a person is relevant to more than one cell in the table, a special convention of some sort will be needed if the sum total of the cell entries is to be equal to the total number of the employed.

knowledge access, a patent holder or the regularity authority may block it from using the particular technique as in Fig. 2-1b. Note that this is an institutional matter rather than a technological matter. Also note even if the access status of the unit is not enough for the particular knowledge, the tangible capital stock in which the latest knowledge is embodied may make it possible for it to use the particular knowledge in the production. This is one of the key roles of tangible capital.

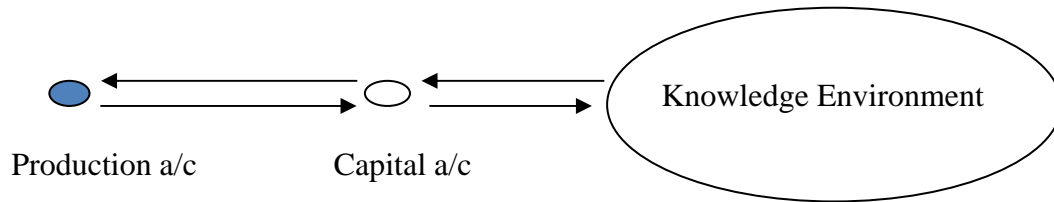


Fig. 2-1a

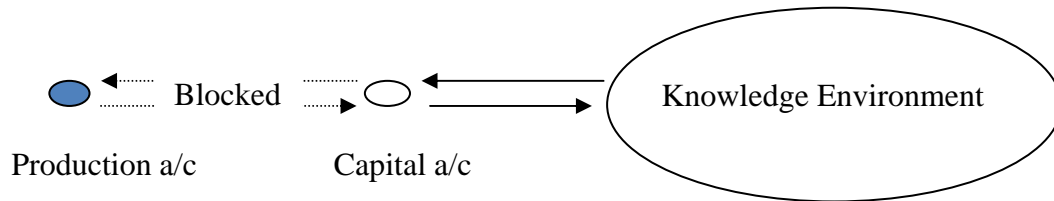


Fig. 2-1b

The capital account in the figure is a special capital place adjacent both to the production place and the knowledge environment (KE). In order to show the accessibility to particular existing knowledge by the firm that control the production, in the figure, knowledge flows pass through capital accounts to (from) production accounts. Of course, as knowledge is not consumed by using it, knowledge used in the production returns to the KE like in the case of the use of land or other environmental factors (in the case of adequate utilisation).

Let us consider the case in which knowledge creation is necessary. Because knowledge creation (creation of a new inmate of the World 3) is not economic production, a special treatment is needed to recognise and record the cooperative efforts involved. We propose later in this section that the activities for knowledge access including knowledge creation should be treated as "quasi-public" expenditures made by private bodies. However, if we notice the similarity between development-type expenditures and work-in-progress-type expenditures, it is rather easy to show that the treatment of development cost as work-in-progress is possible and quite reasonable particularly from the viewpoint of individual business units though current business accounting practices do not allow the treatment of R & D expenditures as assets but for exceptional cases.

Suppose a new environmental regulation is introduced and new technology must be developed to clear it. If the firm has access to state-of-the-art environmental

technology, it can possibly invent, say some devices for it, though it may fail. Let us assume that it needs one accounting period to develop the technology and it will begin to produce in the way that satisfies the regulation in the second period. In this case, the first period may be deemed to be a preparatory stage to the production.

Consider what looks like a reasonable treatment in national as well as business accounting. That is, we consider what we call a work-in-progress-type treatment of development cost. In the proposed treatment, development cost is recorded as if it were a kind of work-in-progress. Typically, work-in-progress is recorded when the production takes more than one accounting periods. In the period(s) in which the production is in process and not yet completed so it is in the preparatory stage, work-in-progress entries are made and in the period when it is completed, (accumulated) work-in-progress is transferred to the inventory of finished goods for example. Or alternatively the work-in-progress recorded in the first period is credited in the capital account and debited in the production account in the second period to show that it is to be processed in the second period. After processing, a new work-in-progress entry will be recorded to reflect the fact that the production process has proceeded.²²

The proposed treatment is that work-in-progress-type entries are recorded for the costs borne for development activities in the accounting period(s) until the development is completed. Except for the cases where the production in which the technology developed is used lasts for only one accounting period (one year), fixed capital entries called “development cost” should be made and amortisation entries should be recorded.²³

In Table 2-2a below, it is presumed that the development cost is treated just as if it were work-in-progress. In the second period, it is credited in the capital account and debited in the production account suggesting that the development is preparatory to the production in the second period. This is often the case in activities in think-tanks.²⁴

²² Concerning the treatment of work-in-progress, see for example, paras.6.72-79 in the 93SNA. It may be worthy of noting that work-in-progress entries may be recorded for services as well as goods. For example, in the case of repair services it may take longer than one period to finish. Note that in the latter treatment described in the text, the measure of intermediate consumption increases by the amount of the work-in-progress than in the former. In the numerical examples shown below for the work-in-progress-type treatment of development cost, this latter treatment for the work-in-progress is applied mainly because it is often the case that there may be no inventory account for the activities in question.

²³ Note that although the 93SNA recommended the basic price valuation (including estimated mark-up to the production cost) for work-in-progress the production cost valuation is used in the numerical illustrations here. For one thing, it is because the production cost valuation is more suitable for business accounting practices. Noting that the treatment described above is not necessarily consistent with the proposed valuation, it seems more desirable that the basic price valuation should be applied when the work-in-progress in question is transferred to the finished goods or the semi-finished accounts.

²⁴ It is suggested that employees’ compensation or other workers’ compensation (often included in operating surplus/mixed income) should be divided into (the monetary value of) the time spent for development by workers and the rest.

Table 2-2a A work-in-progress-type treatment of development cost
(A simple case)

Production	Period 1	Production	Period 2
Intermediate consumption (50)	Development cost (150)	Development cost (150)	Gross output (500)
Monetary value of time spent for development and other workers' compensation(50)		Intermediate consumption (100)	
Fixed capital consumption including access capital used up(50)		Employees' compensation (100)	
		Fixed capital consumption(50)	
		Operating surplus (100)	
Capital	Period 1	Capital	Period 2
Development cost (150)	Fixed capital consumption(50)		Development cost (150)
			Fixed capital consumption(50)

Of course, the technology developed in the first period can be used not only in period 2 but period 3, 4 and so on. It is clearly the case when a certain device is produced in period 1 and come into use in period 2. Naturally, the device continued to be used in periods 3, 4 and so on.

In the cases where the new technology is embodied in the devices, we can consider that the capital consumption measure of the devices includes their development cost as well. In addition, the life of the devices is more or less similar to that of new technology, considering Simon Kuznets' famous view on "modern economic growth."²⁵

In Table 2-2b, it is assumed that the development activities lead to the production of some device(a prototype model) by using which the firm can abide by the new rule and that the development cost is transferred to fixed capital. As shown in the table, where the economic life of the device is assumed to be three years, if the R & D is embodied in capital equipments and it is used by the firm which has developed the technology only, both of the development cost and the tangible capital asset formation (the device) involved are considered to be treated properly in the ordinary national

²⁵ See Kuznets (1979), "Capital Formation in Modern Economic Growth (and some implication for the past)," pp.121-164 , in particular.

accounting framework in the manner described. Note in this treatment, development cost as an asset item disappears as early as in the second period. Instead, the entry of tangible capital assets appears. Reasonably, the tangible assets embody most advanced technological knowledge available at the time point they are produced.

Table 2-2b Work-in-progress-type treatment of development cost 2
(Capital consumption case: life=3 years)

Production	Period 1	Production	Period 2
Intermediate consumption (50)	Development cost of the devices(150)	Intermediate consumption (100)	Gross output (500)
Monetary value of time spent for development and other workers' compensation(50)		Employees' compensation (100)	
Fixed capital consumption including access capital used up(50)		Fixed capital consumption excluding that for the device (50)	
		Fixed capital consumption for the device (50)	
		Operating surplus (200)	
Capital	Period 1	Capital	Period 2
Development cost (150)	Capital consumption(50)	Own account capital formation (150)	Development cost(150) Capital consumption (100)

Even in the cases where the development process does not lead to the production of any device, ²⁶the development cost can be treated as if it were a fixed item in line with the above if the economic life of the technology developed in the process can be specified. In Table2-2c below, we assume that the economic life of the technology is three years.

²⁶ For example, some changes in the composition of material inputs in the direction towards zero emission may be brought about.

Table 2-2c Work-in-progress-type treatment of development cost 3
(Changes in material inputs case: life=3 years)

Production	Period 1	Production	Period 2
Intermediate consumption (50)	Development cost (150)	Intermediate consumption (100)	Gross output (500)
Monetary value of time spent for development and other workers' compensation(50)		Employees' compensation (100)	
Fixed capital consumption including access capital used up(50)		Fixed capital consumption excluding amortisation of development cost (50)	
		Amortisation of development cost (50)	
		Operating surplus (200)	
Capital	Period 1	Capital	Period 2
Development cost (150)	Capital consumption(50)		Amortisation of development cost (50) and other capital consumption(50)

The technology developed can be used by producers other than the firm that developed the technology originally. The technology itself is in the public domain, KE. But the latter firm may get a patent for it so that the use of the technology by other firms to the technology may be precluded. However, let us assume that the firm is the only producer of the devices because of some reason or other. And it is assumed that 9 devices (other than own use) are produced in the second period. The price of the device it set will include the development cost (the total development cost divided by ten) as well as current production cost. So, like in the case illustrated in Table 2-2b, the total measure of capital consumption adequately reflects the development cost borne by the firm that first developed the device. See Table2-2d below.

Table 2-2d Work-in-progress-type treatment of development cost 4
(Sales of device case: life=3 years)

Production Period 1		Production Period 2	
Intermediate consumption (50)	Development cost (150)	Intermediate consumption (200)	Gross output excluding the sales of 9 devices (500)
Monetary value of time spent for development and other workers' compensation(50)		Employees' compensation (200)	The sale of 9 devices (@50) (450)
Fixed capital consumption including access capital used up(50)		Fixed capital consumption excluding that for the device (50)	
		Fixed capital consumption of the device(5)	
		Development cost for the production of the devices(135)	
		Operating surplus (410)	
Capital Period 1		Capital Period 2	
Development cost (150)	Capital consumption(50)	Own account capital formation (50) including development cost (15)	Development cost (150) Capital consumption(55)

Even if the firm itself does not produce the devices but provide another firm that produce the devices with the technology, it may be claimed that the total measure of capital consumption of the devices reflects the development cost if the services provided (technical assistance, etc.) has the market value that covers the cost. Notice that the provision of technology may take various forms including licensing and the remuneration received may have various names including royalties except for outright transaction in intellectual property rights. We propose that if there are service elements involved, the payments made between producers should be treated as those for services.²⁷ Purchasing firms might be deemed to be funding for the development activities of the firm that

²⁷ Note even in the case of outright transactions in so called intellectual property rights such as patents and copyrights, there may be service elements involved. In such cases, some convention is needed. For example, the payment for service elements involved may be deemed to be equal to the royalties estimated for one accounting period.

developed the technology. In addition, these expenditures by the purchasing firms may be considered to be for the purposes of the improvement in knowledge access. So, it might be suggested that development cost carried over to the purchasing firm should be recorded in its capital account.

Table 2-2e Work-in-progress-type treatment of development cost 5
(Technical advisory services case: rendered only in period 2)

Production Period 1		Production Period 2	
Intermediate consumption (50)	Development cost (150)	Development cost transferred to intermediate consumption for the production of technical advisory services(150)	Sales of technical advisory services (400)
Monetary value of time spent for development and other workers' compensation(50)		Other intermediate consumption (50)	
Fixed capital consumption including access capital used up(50)		Employees' compensation (75)	
		Fixed capital consumption (50)	
		Operating surplus (75)	
Capital	Period 1	Capital	Period 2
Development cost (150)	Capital consumption (50)		Development cost (150)
			Capital consumption(50)

In Table 2-2e above, it is assumed that the services are sold in the second period only. However, if technical advisory services are sold not only in period 2 but in period 3, 4 and so on, the development cost entries continue to appear as fixed asset entries of the firm that developed the technology in question.

However, in the cases where the technology is freely available, similar devices (or services) will become available in the market if other firms have knowledge accessibility relevant for them to make devices with similar functions with much less development cost. The firm, the original developer, may also sell the devices on the

market but the price it will receive cannot cover the development cost because of the very fact that knowledge is in the public sphere. So, the firm may have a strong incentive to get patent rights.

If the revenue from the subsequent sales fails to cover the development cost, it may be suggested that the development cost should be debited in the capital account only during the development process and credited in the capital account and debited in the production account after the recognition of failure. Otherwise, it may be necessary to record impairment entries (other changes in volume entries). But the efforts made by the firm should be recognised as such.

In addition, another major challenge lies in the fact that you cannot know in advance how long the production of the devices continues or how long the technical assistance services in question continue to be sold. So, the recording of development cost may be ambiguous in character.

As to the treatment of failure, a typical difficulty lies in the exploration cost for example. Because development process is the process of trial and error, naturally, failure often takes place in the process. In the proposed treatment of development cost, it matters whether the failure takes place in one continued process or not. It is not necessarily the case even when the same exploration company conducts the plural exploration activities in question. In addition to the technical problems involved, because those costs are partly or wholly, borne by the public bodies quite often, political difficulties including those with the measurement of the public sector's financial position may arise. An implication of this criterion may be that we should treat research expenditures totally differently from development expenditures.

The problem that should be addressed seems to be how we treat publicness in activities in the private sector. On top of R & D just described, what should be addressed are philanthropic activities in profit earning businesses and certain functions performed by banks and other financial institutions. The current practices of the SNA do NOT necessarily succeed in dealing properly with the above mentioned activities in the private sector. In addressing the problem raised, the difference between business accounting and national accounting should be reconsidered carefully.

In business accounting, what is concerned is, among other things, the cost-benefit situations involved of the particular economic agent. In contrast, what national accounting should describe is, among other things, how cooperative efforts among people work. For business accountants, intangibles recorded in the accounts may be an important evidence for profitability of the business. But we should know that it is highly dependent on (international) public policy towards intellectual property rights. Too high profitability might mean that such rights are protected to a greater than needed level.

We propose that a satellite account off the main framework of the SNA which shows knowledge access activities inclusive of those related to knowledge creation as well as maintenance or improvement in knowledge access in terms of by which sector (or industry) the expenditures are borne, toward what kind of fields/levels the expenditures are directed. It is worthwhile to note that even unsuccessful efforts of the unit may be useful for the improvement in knowledge access capabilities.

Table 2-3 Account for Knowledge Access Activities

Field/Level	Industry	Sector	Goods and Services including time spent
Environmental/most advanced	Agriculture	Public sector	...
Environmental/advanced
...	Education	Private sector	...
...

The expenditures on the debit sides of the production accounts which are deemed to be made for knowledge access purposes are reclassified by goods and (non-factor and factor) services categories including time spent by workers for knowledge access valued in monetary terms and copied to the rightmost column of the table. The other three columns of the table may be considered to be those that reclassify the expenditures of the rightmost column. Public sector/private sector division may be the most important one to be distinguished because of differences in funding among other things. See Table 2-3.

In addition, the expenditures related to such activities as knowledge access including knowledge creation, which may be deemed to be quasi-public activities, might be separated out and transferred to the production account of quasi-public activities as in Table 2-4 below.

Table 2-4 Accounting for quasi-public activities
Production a/c of the firm which makes knowledge access expenditures

Debit	Credit
Goods and services consumed for the knowledge access including capital consumption	Quasi-public expenditures

Production a/c of the quasi-public activities

Debit	Credit
Quasi-public expenditures	Quasi-public purposes (knowledge access)

The expenditures in question for knowledge access purposes are treated as if they are part of (collective) government services. Under this treatment, it may be claimed, the development-type expenditures made by the enterprises and those by the governmental units or private non-profit bodies can be more consistently treated.²⁸ And

²⁸ Technological developments for environmental protection often take place in the public sector as well.

this treatment may be considered to be more consistent with the view that knowledge once created will immediately come to be placed on the public sphere (KE) .

Computer software and other "intangible fixed assets" items

At the end of section, we will discuss the treatment of computer software and some other items, which are called "intangible fixed assets" in the 93SNA.

“Intangibles” have two categories in the SNA: “intangible fixed assets” and “intangible non-produced assets.” The latter will be the focus of the next section.²⁹

Firstly, it should be stressed here that most computer software is tangible in proper sense of term.

Let us take an example of electrical home appliances. They are often programme-controlled recently. Even small remote control units include programmes in them. Different functions may be performed by the appliances by switching from one programme to the other. Clearly, these devices are tangible. Even if the programmes are contained in CR-ROMs or other media rather outright and traded, we do not need to change our position. Computer software should be considered to be a sort of a "component" of a machine.³⁰

Strange as it may sound, in order for computer software to be “machine-readable,” it must appear as physical objects.³¹

Programmes themselves are in the World 3 in Popper’s term. The relation between computer software which we consider to be parts of machines and programmes may be the same as that between books and a novel contained in it. Computer programmes and novels are both copyright entities (works). In order to function in computers, programmes need to be contained in physical objects like CD-ROMs just as novels are contained in books though machines cannot read books.

You can also download a new programme for your appliances, say, your mobile device, to have its functions improved. This change is of course due to the services rendered to your mobile device. In the SNA, the tradition is that it should be treated as fixed capital formation like major improvements to fixed assets or so called capital repairs if it is not small-sum and you are a producer.

Thus, computer software is better treated as fixed assets in the traditional sense rather than “intangible fixed assets.”

The above is only half the story. There is a notorious question called the original/copy problem in the 93SNA. Computer software mentioned above should be

²⁹ Note the word “fixed” implies it is produced and “fixed assets” and “fixed capital” are synonyms.

³⁰ Takahashi (1983, p.175) wrote: “From what we have seen, it may be understood that computer software is a machine just as computer hardware is a machine. Because in contrast with hard machines it is a ‘soft machine,’ that is, it is just a written pattern on a sheet or magnetic tape, it has an important characteristic that it can be copied very easily. (snip) So, it is software that benefits most from large scale production.”

³¹ The real meaning of the word “machine-readable” may be that it can function in computers.

regarded as the copies rather than the originals. Not only packaged software but also design- to-order software should be regarded as copies outside original producers.

As is well known, it is assumed that two- stage production takes place with regard to computer software and several other items in 93SNA.

The first stage is concerned with the production of originals inclusive of the development of the software. The second stage refers to the production of copies. The main claim we should like to make is that the copies including computer software and other items (books, DVD, etc.) may be fixed capital formation or intermediate or final consumption depending on ordinary accounting rules.³²

As far as the production processes of the originals are concerned, it seems that the development cost related with the production of computer software (copies) or other copies (books, etc.) may be treated like other development cost that we have discussed earlier in this section. In line with what we have discussed so far, development cost as a capital (asset) item should be recorded in these cases as well. This may be considered to correspond to the production process of originals of computer software, etc.

The treatment of originals of computer software shown in the 93SNA, paragraph 6.144, seems to be consistent with our view excepting that the mar-up (actual or estimated) is added to the production cost in the SNA's recommendation.

Thus, the work-in-progress- type treatment of development cost may be applicable to the originals of computer software. Clearly, entertainment, literary or artistic originals as well is better treated when they are seen as development cost. It is worth noting that some of the existing business accounting practices concerning master recordings, etc., may be considered to be consistent with our view. Thus, it is prescribed to the effect in the US Statement of Financial Accounting Standards (SFAS50) that the portion of the cost of a record master borne by the record company should be reported as an asset if the past performance and current popularity of the artist provides a sound basis for estimating that the cost will be recovered from future sales.³³ However, it should be stressed again that it is the cost incurred not capitalised future benefits that should be reported as an asset.

4. Topics on selected intangible assets

³² When the accounting is addressed to production processes of libraries, museums, schools, etc., somewhat different criteria might be needed from ordinary accounting rules. Note in passing that original manuscripts of authors should not be regarded as originals in the sense of paragraph 6.143 in 93SNA. Of course they are museum items. So they are prerequisite to production processes of museums, etc. and they need to be treated as fixed capital formation in the ordinary sense rather than valuables because they are not simply stores of value in that the conservation and restoration (maintenances) are needed to original manuscripts, etc. for example.

³³ Otherwise, that cost should be charged to expense. The amount recognised as an asset should be amortised over the estimated life of the recorded performance using a method that reasonably relates the amount to the net revenue expected to be realised. See Financial Accounting Standards Board (1981, para.11).

In this section, we will consider the other category of intangible assets in the 93SNA, “intangible non-produced assets.” They are typical intangible assets, which are deemed to come into existence not through production. They are constructs of society.

Although, in the SNA, they appear as reconciliation items, they should be considered to appear in flows between right holders and the society's central unit (Government). See Figure 3-1 below.³⁴ If you would like to analyse the income distribution side of the matter, you could reroute the relevant rent flows included in commodities' prices via the central unit. The outright assets may be considered to have the market value which may be calculated by capitalising the rent flows involved. By putting these items in other changes in volume of assets accounts as reconciliation items, the distribution side involved in the matter would be obscured.

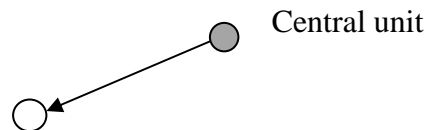


Figure 3-1

Such constructs devised by society include patent rights³⁵, copy rights, trademarks, exploitation right, etc. A new comer arrived quite recently: emission rights. In addition, in 93SNA, purchased goodwill is included in this category.

Often the public authority grants patent rights or other similar exclusive rights to persons to whom particular “knowledge creation” is attributed (supposed inventor, supposed author, and supposed discoverer etc.) in order to further knowledge creation including authoring, composing or other creative activities. However, it must be stressed whether it does so or not (and if so, how and to what extent) is a matter of policy. There is no natural value of knowledge creation.

While patent rights and other typical intangibles come into existence by legal actions, goodwill does come into existence through accounting action rather than legal action.³⁶

In what follows in this section, the focus is on the concept of (purchased) goodwill. Although it is an established business accounting concept, "purchased goodwill" is a very special category in that it appears only when a company purchases another company. According to typical business accounting textbooks, it can be thought

³⁴ Concerning the graph-theoretical presentation of accounting systems, see Sakuma (2006).

³⁵ See 93SNA, paragraph 13.19 uses the term, “patented entities”, but this seems to be confusion in terms. For, the term “patented entities” looks as if they mean knowledge or knowledge access behind the rights although the socially constructed assets are the rights themselves. Unfortunately, this confusion can be found in Hill (1997) as well. Thus, copyrights, patents etc. are not a legal instrument providing evidence of ownership over the relevant knowledge created. The relation between the two is not the deeds of a house and the house itself.

³⁶ See 93SNA, paragraph 13.17.

of as a "premium" for purchasing a business. That is, it is the difference between the purchase price of the company acquired and its book value (the shareholder equity).

When a company purchased another company, two alternative accounting methods may be applied: pooling of interests method and purchase method.

Because when the pooling of interests method is used, the balance sheets of the two businesses are simply combined and no goodwill is created, this method looks very clear and rather familiar to national accountants, who often combine (or consolidate) accounts of plural economic units in order to form sectoral accounts.

Although the pooling of interest method as a business accounting practice uses historical cost valuation, this valuation method is not appropriate for national accounting, in which current price valuation is thought to be the suitable valuation method.

When the purchase method is used, the acquiring company will put the premium they paid on their balance sheet under the heading "Goodwill." Typical accounting rules require the goodwill be amortised in the course of 40 (or 20) years or impairments should be recorded if they take place. If you follow the purchase method and compare the combined account before and after the acquisition in question, you will find a new asset called goodwill appear in the latter rather abruptly. See Figures 4-1a through 4-1e. In the figures, we assume that share holders of Company B (the company acquired) agreed to exchange their shares with those of the acquiring company. In addition, we assume that the share prices change over time while other asset prices are constant focusing on the differences in balancing items between business and national accounting and that the total share value of the companies B is 900 and that of the company T is 1100 at the time of acquisition.

In the pooling of interests method (Figure 4-1c), note the share values are not relevant and the two balance sheets are simply combined using historical cost valuation. In Figure 4-1d, where the purchase method is applied, the value of the assets held by the acquiring company (T) is increased by the share value of the company acquired (B). The value of the total assets is not 1000+1500 but 1000+1500+500(goodwill). A reasonable treatment for national accountants will be found in Figure 4-1e, where the national accounting balancing item "(independent) net worth" is calculated by using the current price valuation instead of historical cost valuation noting that shares are included in the liabilities in national accounting.³⁷

B Company	
Assets	Liabilities
1000	600
	Capital
	400

Total market value 900
Figure 4-1a

T Company	
Assets	Liabilities
1500	1000
	Capital
	500

Total market value 1100
Figure 4-1b

³⁷ In national accounting, net worth is calculated as total value of assets minus total value of liabilities including the second party liabilities (shares and other equities). So, it is called "independent" net worth.

T+B Company
(Pooling of interests method)

Assets 2500	Liabilities 1600
	Capital 900

Figure4-1c

T+B Company
(Purchase method: T purchased B)

Assets 3000 Of which Goodwill 500	Liabilities 1600 Capital 1400
---	--

Figure4-1d

T+B Company (Pooling of interests method: national accounting version/before and after the acquisition)

Assets 2500	Liabilities including shares 3600
	Net worth -1100

Figure4-1e

Summing up, (i) Recorded goodwill may be regarded as current valuation gain or loss. In other words, it is the difference between net worth in current prices and that in historical cost. Such valuation changes should be recorded within the national accounting framework but not in the way described above; (ii) Though apparently goodwill seems as if it were an established accounting construct, the accounting treatment through which it is recorded varies including the cases where no goodwill is recorded. Even if the purchase method is adopted, amortisation rules vary;

Business accountants might say goodwill is a kind of proxy to various intangibles involved. But actually it is an accounting concept needed simply for both sides of the account to balance out. Indeed, there can be negative goodwill. On balance, (iii) the “negative (independent) net worth” item as appears in Figure4-1e instead of that badly made balancing item may serve the purposes that the concept is supposed to do.

Thus, the concept of goodwill is business accounting concept and should not be used in national accounting.

5. Closing Remarks

Some forty years ago, the 1968SNA, in its introduction, stated in a section titled “The new system and the future (g) the functional classification of inputs” as follows:

1.93 In the new SNA intermediate inputs are classified by commodity and other inputs are classified by the components of value added but no attempt is made to classify these inputs further. They may, however, perform a number of more or less distinct functions in addition to providing a basis for productive activity. Some may be used to maintain recreational and medical facilities which, in part at least, are of direct benefit to employees though they may also contribute to productiveness. Others may be used to maintain research and development facilities and it is not altogether clear that these should be regarded as current inputs at all since this year’s research and development work can hardly be expected to contribute to this year’s output unless this work can itself be regarded as output.

1.94 A first stage in dealing with this problem would be to assign the inputs already distinguished to different functional categories, such as current production, welfare or research and development, a task which in general would involve a further subdivision of these inputs. This would lead to a second stage at which it would be necessary to decide how to treat expenditure on the different categories. (...The rest is omitted.)

Where are we now? At the first stage as described above of “functional classification of inputs”? Or at the second stage of deciding on the treatment (of the current/capital boundary)? It seems advisable not to go too far. For, there are many issues involved to rethink about.

Our work-in-progress-type treatment of development cost may be a minimum step forwards but we believe the treatment of “intangible fixed assets” in the 93SNA should be better understood and interpreted if they are to be regarded as development cost as described here.

A combination of a satellite treatment of knowledge access and a work-in-progress type treatment of R &D, software originals (not copies), and entertainment, literary or artistic originals in the central framework accounts will be our recommendation. We believe it is suitable for the present.

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