

PRISM WP5

The Measurement of Intellectual Capital Formation in the System of National Accounts

Peter Hill

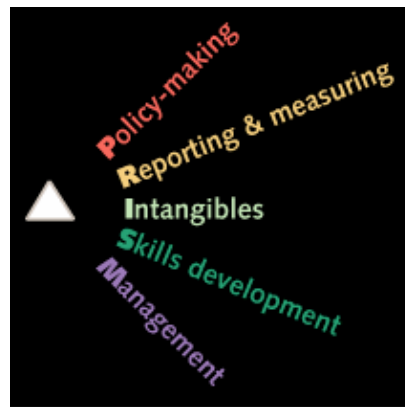
Peter.hill@flordon.freemove.co.uk

assisted by

Richard Youngman

Richard@perleconsulting.fsnet.co.uk

City University Business School



This project is part of a wider initiative named PRISM. PRISM is a multi-disciplinary European initiative aimed at gaining a deeper understanding of the issues surrounding the management and measurement of intangibles in the modern economy. The PRISM group believes that intangible investments are *the* drivers of both competitive advantage and economic value creation, and that they are inadequately evaluated by current measurement and management tools which were devised for an economic context that no longer exists.

PRISM is funded by the European Commission's IST programme. Its findings will be published in the course of 2003, and a special conference will be held in London in July 2003. For more information, visit www.euintangibles.net.

Abstract

There is a compelling economic case for the System of National Accounts (SNA) to recognize certain intangibles as assets and to classify expenditures on them as investment, or gross fixed capital formation. However, changing the way in which intangibles are classified achieves nothing if their production is not measured properly. It is necessary to be able to account for both the production and the use of such assets. In principle, it is desirable to be able to account for intangible assets throughout the SNA as a whole.

This paper is devoted to looking at these issues with respect to intellectual capital and intellectual capital formation. A second paper, shortly to be issued, will look at other kinds of intangible assets, especially scientific and technological originals produced by Research and Development (R&D).

Introduction

The idea of recognizing the value of intellectual capital has a long history. In Chapter III of his *Principles of Political Economy*, (1848), for example, J.S.Mill wrote:

“The skill, and the energy, and perseverance, of the artisans of a country, are reckoned as part of its wealth no less than their tools and machinery. According to this definition, we should regard all labour as productive which is employed in creating permanent utilities, whether embodied in human beings, or in any animate or inanimate objects.”

More recently there have been numerous papers suggesting various ways in which knowledge and skills might be recognized as intellectual capital.

The consensus emerging from these papers is that intellectual capital - that is, the stock of knowledge and skills possessed by persons - is large and makes a major contribution to production, productivity and welfare. However, neither intellectual capital nor intellectual capital formation are recognized as such in national accounts. The various inputs into the process of intellectual capital formation are either ignored or misclassified. The purpose of this report is to investigate what is the appropriate way in which to incorporate intellectual capital and capital formation within the SNA. The intention is to preserve the fundamental concepts of the SNA, only changing some of its conventions, bearing in mind that conventions are, after all, only conventional.

Firstly, it is important to distinguish between knowledge and information. *Knowledge* must be *known* by someone. Knowledge is not the same as information. *Information* is used here as a generic term here to mean established facts, data, science, history, etc. that have been created or discovered and are stored in one kind of medium or another in libraries or other depositories of information. Any one individual can know only the tiniest fraction of the total information in existence around the world. The intellectual capital relevant to an individual producer is that possessed by the producer's employees and associates.

Knowledge, and also skills, cannot be acquired passively without any effort on the part of the persons acquiring them. On the contrary, the acquisition of knowledge is a process of production carried out by the persons acquiring the knowledge. It requires work and application on the part of the individual persons concerned when they attend classes or engage in private study and practice. From an SNA viewpoint, the production and acquisition of knowledge should be treated as a form of own account production and capital formation carried out by households, and that the educational services produced by the education industry are consumed as intermediate inputs into the production of knowledge. Tentative estimates of the costs of the labour inputs into this process of production suggest that they may be several times larger than the value of the educational services consumed. Our estimates suggest an order of magnitude in the UK economy of 7% of GDP.

Intellectual Capital as an asset

An asset is defined in the SNA as an entity over which ownership rights can be established and from which economic benefits may be derived by holding them, or using them, over a period of time (SNA, 10.2). Those recorded in the balance sheets of the system are assets over which ownership rights are actually enforced. Assets may be financial or non-financial. Some non-financial assets may have been produced as outputs from processes of production as understood in the SNA. The outputs produced may be classified as tangible assets, such as machinery or structures, or intangible assets, such as new information. Non-produced assets may also be tangible or intangible: for example, tangible natural assets such as mineral deposits or intangible assets in the form of legal instruments created by force of law or by contractual relationships agreed between institutional, or economic, units.

The SNA attaches a lot of importance to the distinction between produced and non-produced assets, but for many analytic purposes an equally important distinction is that between assets used to provide inputs into processes of production and assets that are not so used. When physical assets in the form of fixed and natural assets are used in production they may be viewed as providing flows of capital services as inputs into production. Similarly, persons possessing intellectual capital can be regarded as human assets that provide flows of labour services as inputs into production.

A producer may either own or rent the assets used in production. It is even possible for an economic unit to carry out production without owning any of the physical assets used in production. The actual flows of services provided by the assets are the same whether the assets are owned or rented, so that the distinction between owning and renting is not so important for purposes of production and productivity analysis.

Employees, not employers, own the human or intellectual assets used in production. Employees rent them out to employers. The labour services contributed by employees can therefore be interpreted in the same way as the capital services provided by fixed assets. Compensation of employees can be interpreted as receipts of rentals by the owners of human assets.

Information and knowledge

As already noted, 'information' is used here as a generic term to describe facts, scientific results, history, philosophy, etc., that may be written down and stored on paper, tape, disk etc. Information is an intangible and also a public good. In economics, a public good does not mean one that is publicly provided or financed. It means a good that can be simultaneously consumed by many economic units, the consumption by one unit not reducing the scope for other units to consume it. Public goods in this sense are typically assumed to be collective services such as defence but information also qualifies as a public good. Any number of people can know, and make use of, the same piece of information without reducing in any way the scope for others to know and make use of it. However, by no means are all intangibles public goods.

A clear distinction must be drawn between information, as such, and information stored in the brains of persons. A typical definition of human capital is that provided by the OECD (1998), namely that human capital is the "knowledge, skills, competences and other attributes *embodied* in individuals that are relevant to economic activity" (emphasis added). Only information stored in the brains of persons counts as knowledge. Using the terms 'information' and 'knowledge' interchangeably creates confusion. Information can be stored in various media and may continue to exist whether or not some person or persons happen to know, or be aware of, it. During the dark ages, a lot of the 'information' discovered and developed by the Greeks and others was fortunately stored in libraries for future generations to use even though few people *knew* it until the Renaissance.

Knowledge is acquired information. Persons can only acquire information through study and learning. The creation of knowledge is essentially the acquisition of *existing* information by students or pupils, as distinct from the process from the creating of *new* information, which can be described as the output from research and development activities interpreted in a broad sense. Human capital does not consist only of knowledge or acquired information, however. It also includes the skills that persons can acquire through practice such as musical and sporting skills.

There is usually a limit to the amount of knowledge that any one individual may acquire, depending on the individual's natural abilities, attitudes and perseverance, just as there may be a limit to the skills, whether sporting, musical or surgical, that may be acquired, however much study or practice is undertaken.

The human assets owned by individuals may be exploited directly by them for their own benefit - that is, for purposes of their own production or consumption - or rented out to employers. The remuneration received by employees is the return on the human assets they own. Just as in the case of a fixed asset where the rental payable depends both on the nature or quality of the asset and also on the time it is rented for, the remuneration received by employees reflects the quantity and quality of the assets they possess and the length of time they are used in production.

It should also be noted that knowledge as defined here is not a public good. The intellectual capital possessed by an individual person can typically be used in only one process of production at a time. Employers must compete for the intellectual capital or other special skills possessed by their employees. A surgeon can operate on only one person at a time and a football player can play for only one team at a time. This underlines the distinction drawn here between information, a pure public good, and knowledge possessed by an individual, which is a private good from an economic viewpoint.

Study and practice as processes of production

When pupils, students, trainees, apprentices, etc. attend classes and engage in private study and practice, they should be seen as working for themselves. They are, in effect, self-employed. The outputs from the processes of production in which they are engaged are the knowledge, skills and competences that they produce by their own efforts. The work of the students is not, of course, the only input into the process of producing knowledge or skills. The students consume teaching services provided by educational or training establishments. These services are intermediate inputs into the production of knowledge and skills. Unless the students work, merely attending the classes may produce nothing. The teaching services may simply be wasted, as doubtless happens.

As the additional knowledge and skills acquired are durable assets, the students are simultaneously engaged in capital formation. Thus, study and practice are forms of own account production and own account capital formation. Conceptually, there is no difference between these activities and other forms of own account capital formation undertaken by households already recognized by the SNA and included in GDP, such as the construction of their own dwellings by households or major improvements to dwellings carried out by households.

The type of productive activity in which students are engaged is consistent with the broad definition of production given in the SNA, namely:

“Economic production is defined as an activity carried out under the control and responsibility of an institutional unit that uses inputs of labour, capital and goods and services to produce outputs of goods and services.”¹

The output consists of intangible goods in the form of the knowledge and skills acquired. The production is own account production carried out by households. Productivity may vary considerably from person to person.

The assets produced and acquired are subject to depreciation. Each asset has a normal service life and is subject to deterioration and obsolescence. Knowledge may be forgotten. Skills may be lost, perhaps as a result of aging, as in the case of a sports-person. The knowledge and skills may also become obsolete. In principle, the measurement of depreciation does not pose any greater problems than it does for fixed assets.

¹ SNA, 6.15.

The use of human assets for consumption

Human assets may be used for purposes of consumption as well as production. In this respect, they are no different from many durable goods, such as vehicles, which may be used either for purposes of production or for personal consumption. The same asset may be used for both purposes. Certain basic human assets, such as the ability to read, may be used as much, or more, for consumption as for production. They are equivalent to consumer durables. They may have as much impact on a person's lifestyle and welfare away from the workplace as on the person's capacity to earn rentals when they are used in production.

Implementation within the SNA

The SNA has certain basic concepts and definitions but it is also obliged to rely heavily on a number of conventions. By no means are all productive activities that fall within the SNA's broad definition of production given above actually included in the production boundary that is implemented in the SNA. *By convention*, all household production of services for own consumption is excluded, except for housing services produced for their own use by owner-occupiers, even though, as some have argued, this leads to a massive understatement of the 'true' economic production that takes place within the economy. However, there are, of course, good reasons for this convention because most of the users of national accounts wish to focus on market and monetary activities.

That said, the production of knowledge is not service production and it should not fall under the blanket exclusion of household services. Moreover, the outputs produced are not consumed, being assets that may be used in market production. The specific issue of the production of intangible goods in the form of additional knowledge, skill and competences is not actually addressed in the SNA. In some other places, intangible goods and assets are tacitly, and incorrectly, treated as if they were services.

Given that we propose that the own account production of human assets is to be included within the production boundary of the SNA, the question may still be asked as to whether it is appropriate and analytically useful to include all such production and capital formation or only part of it. Concern about the omission of human capital formation results more from its impact on the analysis of production than its impact on consumption and welfare. It is proposed here, therefore, that only capital formation that is mainly vocational and that is undertaken primarily to enhance the individual's productive capacity, and hence earnings potential, should be brought within the production boundary of the SNA.

In practice, learning, study and practice may be partly vocational and partly non-vocational, but they tend to become increasingly vocational the older the student becomes. It is therefore proposed that the study and practice undertaken by young children should not be included within the production boundary. Only the production that is undertaken by students above a certain age should be counted as own account production and capital formation and included in GDP. This will be taken as the minimum school leaving age, although it is recognized that in some countries the notion of a minimum leaving age may not be very clear cut. When children reach this age they

have a choice of whether to seek gainful employment or incur the opportunity cost of continuing in higher education. This cost may be measured by the foregone earnings from not taking immediate employment. The time spent in study, training or practice may be valued by the average earnings of persons of the same age in employment.

Although excluding children in school below the minimum leaving age may be regarded as somewhat arbitrary, it is no less arbitrary than many of the conventions already incorporated in the SNA. The assets produced by children in primary education are basic human assets that are used as much for purposes of consumption as production. However, most students in higher education, which is often quite explicitly vocational, are primarily engaged in producing and acquiring assets intended mainly for use in production over their future careers. Treating students in higher education as being engaged in own account production and capital formation is likely to yield results that are more useful analytically, at least for purposes of productivity analysis, than the two extreme alternatives of assuming that either all, or no, children and students are so engaged.

The production account

A student is engaged in production on his/her own account. Each student has his/her own process of production which falls within the household sector of the SNA. As already noted, the inputs into this production are the student's own work, the educational services consumed and any inputs of capital services, such as housing services. The output consists of the additional knowledge or skills produced and acquired. Following conventional SNA procedures, the output may be valued on the basis of its costs of production: that is, the sum of the education services consumed as intermediate inputs plus the estimated value of the student's work plus the value of any capital services consumed. As the whole of the output consists of assets that are acquired by their producers, it counts as final output that contributes directly to GDP.

This treatment involves a significant extension to the SNA production boundary which increases measured GDP. As the students are self-employed, they must be treated as 'economically active' and part of the labour force. This implies a significant expansion of the labour force of perhaps as much as 10% depending on the country.

Educational services

There are several ramifications that follow from the proposed treatment. The outputs of the educational establishments concerned are treated as being consumed by the students as intermediate inputs. At present, such services are treated as final consumption. The reclassification of these services does not, in itself, change GDP because the full value of the services consumed as intermediate inputs is included in the value of the output of assets produced.

When the educational services are market services purchased by students or households, the reclassification is straightforward. The whole of the costs of producing the assets are incurred by households. When they are non-market services provided by governments or non-profit institutions serving households, or NPISHs, as defined in the SNA, the situation is more complicated. At the moment, the services are treated as social transfers

in kind that enter into households' actual final consumption. They would continue to be treated as social transfers in kind, but would be used by households for purposes of actual intermediate, rather than final, consumption.

On the expenditure side, the costs of the human assets acquired by households consuming non-market educational services are effectively shared between the government, NPISHs and households. Thus, the expenditures incurred by governments and NPISHs could be reclassified as gross capital formation, bearing in mind that they constitute only part of the costs of the relevant capital formation, the rest being contributed by households mostly in the form of the value of the students' work.

Education and training provided by employers

Training provided directly by the employer, or at the employer's own expense, can make a considerable contribution to the production of intellectual capital. Statistics are not easily obtainable on the total costs of the training provided or financed by employers, but common observation suggests that it may be considerable. Conceptually, the production must still be treated as being carried out by the employee. The resulting assets clearly belong to the employee, not the employer, even though the costs are borne by the employer.

In effect, the employer is providing a benefit to the employee and makes a free transfer in kind to the employee. The production of the intellectual capital is not part of the employer's principal production activity or activities and should be clearly distinguished from them. In principle, the training should be treated as if it were being provided by a separate establishment whose function is to produce educational services that are used by the employees to produce intellectual capital. The value of the intellectual capital produced, as in the case of students engaged in full time study, has to be estimated or imputed on the basis of the total costs incurred, including the wages and salaries paid to the employees while they are undergoing training. By recognizing the training as a separate activity, the employer is recognized as having an additional output in the form of educational services. None of the costs associated with the training activity should count as costs of the employer's principal activity. If these costs were no longer to be charged against the employer's principal activity, the gross value added from this activity would be increased, and as would total GDP.

Looked at from the expenditure side, GDP rises because the intellectual capital produced is recognized as part of final output whereas this output was not separately identified previously. The costs of producing this output were previously treated as if they were either part of the intermediate consumption or labour costs of the employer's principal activity or activities. The employer incurs all the costs of producing the intellectual capital but then provides it as free transfer, or gift, to the employees concerned. This resembles a free social transfer in kind provided by government. Although recognizing the output of intellectual capital increases the employer's gross value added, it does not change the employer's disposable income. In effect, the cost of the transfer made to the employees becomes an appropriation out of profits that reduces the amounts available for

distribution to shareholders or other purposes. Changing the accounting conventions does not change underlying profitability.

Even though the assets resulting from the employer's training, and also learning by experience on the job, belong to the employee, the employer has a reasonable expectation of being able to retain the services of the employees and to continue to rent their special skills over the foreseeable future. In some cases, the employer may be able to tie in the skills for a period of time by contract. A contract of employment with a skilled employee is equivalent to a long-term lease on a special kind of equipment. Employers may also use all kinds of inducements such as pension schemes or untaxed compensation in kind to try to persuade employees with special skills to remain with the employer.

Trying to account for the production of intellectual capital by workers when all the costs, including the employees wages and salaries, are borne by the employer is conceptually complex. From a practical viewpoint there are also serious problems. The employer may not keep records and accounts in sufficient detail to enable the accounts for the training activities to be split off from the rest of the employer's activities. Only when a firm has a large and continuing programme of training activities is this likely to be feasible. When the training is undertaken only sporadically it may be carried out by staff who are normally engaged in the principal activity or activities of the firm and use facilities that are also normally used for other purposes. In such cases, accounting for the training activities on their own will clearly be difficult.

The difficulty of accounting for training activities carried out in-house is symptomatic of the general difficulty of recording production for own use. It is particularly difficult for in-house training, but similar difficulties emerge when trying to measure in-house R&D or software. To capture the production and use of intangibles, therefore, it is by no means sufficient simply to change concepts and classifications within the SNA. A more intractable problem is that many intangibles may be produced for use within the same firm without ever touching the market. This type of production is described as 'own account production' within the SNA. It is intrinsically difficult to record and measure. As already noted, it may be carried out within households as well as firms

Imputations

Measuring the production of intellectual capital in the ways proposed above results in a substantial increase in the proportion of output and GDP whose value has to be imputed. However, for certain analytical purposes the inclusion of additional non-monetary flows in GDP can reduce the usefulness of the data. Not only does the treatment increase GDP and gross capital formation but also households' incomes. *None* of the increased incomes is *disposable* in the way that monetary incomes can be spent on any kind of consumption. The extra income is all earmarked for household gross capital formation. Households' savings automatically increase by the full amount of the increased income. For analyses of consumer behaviour the additional income and saving may not be helpful because households have no discretion about how to dispose of the additional income. It must be

invested in human assets. This kind of objection may be made against the inclusion of other kinds of household production within the production boundary of the SNA.

Such objections are not decisive. Informed users of the accounts always have the option of removing imputed flows for particular kinds of analysis. The users have a choice. However, if the imputation is not made, the accounts do not provide users interested in productivity analysis with the information they need on gross capital formation. Given the central role of knowledge in today's economy, this would mean the SNA would gradually decline in its utility and relevance to economic and policy analysts. In addition, experience suggests that when statistical agencies do not provide analysts with the kind of information they require, the analysts will construct, even invent, their own estimates indulging in whatever creative or imaginative accounting is necessary. Statistical offices are always better placed to make experimental estimates and have a much better appreciation of the limitations of the results, which can always be explained to users.

It is better to be approximately right than exactly wrong.

The size of intellectual capital formation

Some very tentative estimates have been made for the UK of the possible order of magnitude of intellectual capital formation, as defined in this paper, relative to GDP.² They involve estimating the numbers of students aged 16 and over and multiplying the numbers in each age group by the estimated average yearly earnings for employees of the same age. Estimates are also required of the proportion of total education expenses attributable to the 16 and over's. Estimates for intellectual capital acquired by on the job trainees are based on data on training expenditures.

The results are summarised as follows.

Full time students:	Percentage of GDP
Intermediate consumption of education services	1.5
Value of students' work	3.8
Capital formation by employees:	
Intermediate consumption of training services	1.2
Value of trainees work	0.7
Total	7.2

The estimates for capital formation by employees are very speculative, but are more likely to be under than over estimates. It is noticeable that in the case of full time students, the estimated value of their labour input is two or three times larger than the cost of the educational services they consume. Simply reclassifying educational expenditures from consumption to capital formation is not the way to capture intellectual

² These estimates have been made from data from the Office of National Statistics, The Department of Education and Skills and from PwC's HR benchmarking survey.

capital formation. These estimates are very rough but suggest that the production of intellectual capital is a major activity worth further serious investigation.

Stocks of human assets

Estimates of the stocks of human assets may be built up by applying the perpetual inventory method to the flows of gross human capital formation just described. From a methodological viewpoint, there do not appear to be any more problems involved in estimating the stock of human capital in this way than for estimating the stock of fixed assets.

Estimates of the stock of human assets built up in this way would be based on the costs of producing the assets. The returns from the assets accrue over the lifetimes of the individuals in the form of future earnings. If earnings data are available in sufficient detail, it is possible to estimate the lifetime earnings profiles for different types of workers. This in turn makes it possible to estimate the present discounted value of lifetimes earnings for different categories of workers. Economic theory suggests that these discounted values should equal the costs of producing the assets. If the present values exceed the costs the numbers of students should increase. If the costs are greater the numbers should decline.

Attempts have been made to estimate the value of the stock of human assets using the discounted values of lifetime earnings (see, for example, the estimates made by the Australian Bureau of Statistics (2001)). It would be useful to test the robustness of estimates of the stock of human assets by confronting estimates made from the cost side with estimates based on the returns on the assets. Such an exercise would be a difficult major research undertaking that has yet to be undertaken for any country.

Conclusion

This paper has argued the case that intellectual capital formation is a productive activity which is not properly represented in the SNA even though the SNA is supposed to account for the productive activity of an economy.

Some very tentative estimates have been put forward of the size of such intellectual capital formation activities in the UK. The subject demands more serious consideration and research.