

# Accounting Issues on the Measurement and Bookkeeping of Research and Development Expenditures within the European Research Area

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*Valuation of intangible assets, management and reporting related services are expected to play a significant role in the proper functioning of the European Research Area (ERA), as well as the operation of the single market and the sustainability of all aspects of the economy in Europe. Without readily available administrative, legislative, financial or other public services, economic actors—both at the corporate and state level—cannot fully utilize the opportunities available in the information society. This paper evaluates the reporting methods and performance measurements for the accounting of the intangibles (Research and Development (R&D)), analyzes the strengths and weaknesses of each of these parameters, and establishes a framework for their application. The findings of the study reveal that most forward thinking companies, as part of their strategic processes, are constantly examining the appropriateness of their structures in achieving business excellencies.*

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## Introduction

The European Research Area (ERA) was set up in 2000 in the European Union (EU) aiming to:

- Enable researchers to move freely from one member country to another;
- Develop world-class research infrastructures together to share the extremely high building and operating costs;
- Share, teach, evaluate and use scientific knowledge effectively for social, business and policy purposes;

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- Optimize and coordinate all European, national and regional research programs, in order to promote highest quality research throughout Europe; and
- Develop strong links with partners worldwide, contributing to global development, and taking a leading role in international initiatives.

The ERA is supposed to consist of the best talent and motivates the industrial sector to invest more in European research programs. Therefore, the EU is expected to achieve its objective of allocating 3% of GDP to the research programs and strongly contribute to the creation of sustainable growth and occupation.

Eight years on, the creation of ERA has become a central pillar of the EU 'Lisbon Strategy' for growth and jobs, together with the completion of the single market, the European 'broad-based innovation strategy' and the creation of a European Higher Education Area (Errin Policy Group, 2007).

Valuation of intangibles, management and reporting related services are expected to play a crucial role in the proper functioning of the ERA as well as the operation of the single market and the sustainability of all aspects of the economy in Europe. Without readily available administrative, legislative, financial or other public services, economic actors—both at the corporate and state levels—cannot efficiently make full use of the opportunities available in the information society.

The term 'research' means incorporating the discovery of new knowledge for the development of a new product or process or bringing about a significant improvement to an existing product or process (Bernstein, 1990; and Tahinakis *et al.*, 2006). The term 'development' means the research findings into a plan or design for a new product or process or a significant improvement to an existing product or process. Therefore, the term Research and Development (R&D) excludes routine or periodic alterations to the ongoing operations and market research and testing activities (Tahinakis *et al.*, 2006).

## R&D Identification and Disclosure

The word 'intangible' is derived from the Latin word *tangere*, which means 'to touch'. Thus, intangible assets can be characterized as those which do not have physical existence and their value being limited by the rights and anticipative benefits that possession confers upon the owner (Meyer, 1985). A wide variety of assets like R&D costs, which usually appear in financial statements, could be considered intangible (Ginoglou *et al.*, 2008).

In the UK, in 1989, the Accounting Standards Committee issued the Statement of Standard Accounting Practice (SSAP) No. 13 – Accounting for Research and Development. The application of the statement is mandatory, if the company is:

- A public company or holding company that has one or more public companies as a subsidiary; or
- An insurance or bank or holding company that has one or more banking and insurance companies as a subsidiary; or

- A parent company with a public limited company or special category company as a subsidiary; or
- A private company which does not satisfy the criteria, multiplied in each case by ten, for defining a medium-sized company (turnover not more than £8 mn, total assets not more than £3.9 mn, and average number of employees not more than 250) (ACCA, 1994).

The Statement defined the different types of R&D costs based on the items used by the Organization for Economic Co-operation and Development. Specifically (SSAP No. 13, para. 21):

- Pure (or Basic) Research: means surveyed or theoretical work undertaken primarily towards new scientific or technical knowledge.
- Applied Research: means original or critical investigation undertaken in order to gain new scientific or technical knowledge and directed towards a specific practical aim or objective.
- Development: means use of scientific or technical knowledge in order to produce new or substantially improved materials, devices, products or services, to install new processes or systems prior to the commencement of commercial production or commercial applications, or to improving substantially those already produced or installed (HM Revenue and Customs, 2000).

In addition, the Statement lists not only examples of activities that would normally be considered<sup>1</sup> as R&D costs, but also those which should be excluded.<sup>2</sup> However, it does not provide guidance on the types of costs, which can be included within the category of R&D.

The Statement, moving beyond the British practice, proposes the required accounting practice, which can be summarized as follows:

<sup>1</sup> SSAP 13, para. 6: "...(a) experimental, theoretical or other work aimed at the discovery of new knowledge, or the advancement of existing knowledge; (b) searching for applications of that knowledge; (c) formulation and design of possible applications for such work; (d) testing in search for, or evaluation of, product, service or process alternatives; (e) design, construction and testing of pre-production prototypes and models and development batches; (f) design for products, services, processes or systems involving new technology or substantially improving those already produced or installed; and (g) construction and operation of pilot plants..."

<sup>2</sup> SSAP 13, paras 7,17-18: "...7...(a) testing and analysis either of equipment or product for purposes of quality or quantity control; (b) periodic alterations to the existing products, services or processes even though these may represent some improvement; (c) operational research not tied to a specific Research and Development (R&D) activity; (d) cost of corrective action in connection with break-downs during commercial production; (e) legal and administrative work in connection with patent applications, records and litigation and the sale or licensing of patents; (f) activity, including design and construction engineering, relating to the construction, relocation, rearrangement or start-up of facilities or equipment other than facilities or equipment whose sole use is for a particular research and development project; (g) market research;...17...expenditure incurred in locating and exploiting oil, gas and mineral deposits.... However, development of new surveying methods and techniques as an integral part of research on geographical phenomena should be included in R&D;...18...R&D expenditure which is reimbursed by third party. Any such expenditure which has not been reimbursed at the balance sheet date should be dealt with as contract work in progress..."

- The cost of fixed assets acquired or constructed in order to provide facilities for R&D activities should be capitalized and written off<sup>3</sup> over their useful life through the Profit and Loss Account. The depreciation so written off should be included as part of the expenditure on R&D. Where an asset is used for development activities only, the depreciation can be regarded as part of the overhead costs to be included as part of the development costs.
- Expenditure on pure applied research should be written off in the year of expenditure through the Profit and Loss Account because it can be regarded as part of a continuing operation required to maintain its operating status and competitive position in the market.
- Development expenditure should be written off in the year of expenditure, except in the case it may be deferred to future periods subject to the following conditions:
  - There is a clearly defined project;
  - The related expenditure must be separately identifiable;
  - The outcome of such a project must have been assessed as certain, as to its technical feasibility and its ultimate commercial viability;<sup>4</sup>
  - The aggregate of the deferred development costs and the related production, selling and administrative costs are expected to be exceeded by related future sales or other revenues; and
  - Adequate resources must exist or be available in order to enable the project to be completed.
- The criteria for determining whether development expenditure may be deferred should be applied consistently from year to year and all projects meeting the above criteria must be treated in the same way.
- If development costs are deferred to future periods, their amortization should commence with the commercial production of the product, service, process or system and should be allocated on a systematic basis to each accounting period, by reference either to the sale or use of the product, service, process or system or the period over which these are expected to be sold or used.
- Deferred development expenditure should be reviewed at the end of each accounting period and where the circumstances which have justified the deferral of the expenditure

<sup>3</sup> "... (a)...to either the sale or use of the product; and (b)...to the total time over which the product is expected to be sold or used. If the first basis is adopted, amortization may well be bell-shaped low at first as the product struggles to gain a market, peaking in the middle as its market penetration is maximized, then low at the end as its sales drop off. If the second basis is used, amortization would be by the straight-line method. Whichever is adopted, the length of time over which amortization should occur must be selected. Given the amount of complex forecasting that may be involved, particularly in the case of the adoption of the first basis, it is very unlikely that any consistency in approach would be found between companies faced with similar amortization decisions..."; Sangster A (1994), *Workbook of Accounting Standards*, p. 44.

<sup>4</sup> The existence of competing products, the impact of the economic situation on demand, the likely effect of inflation on sales prices and costs, the effects on prices of any scarcity of resources, etc.

no longer apply, or are considered doubtful, the expenditure, to the extent to which it is considered to be irrecoverable, should be written off immediately (SSAP No. 13, paras. 28-29).

- Development expenditure once written off may be reinstated if the uncertainties which had led to its being written off no longer apply.

The British Accounting Statement has been criticized on the grounds that companies have the right to express an opinion of whether or not to defer development expenditure (Anthony *et al.*, 1995). However, it would be impossible to force companies to carry forward development expenditure due to the subjectivity of the criteria.

The disclosure, generally, should provide adequate information to the users of financial statements in order to understand the nature of a company's R&D activities (Wechsler and Wandycz, 1990). In this direction, the annual report should provide a general description of R&D activities, the magnitude of expenditures and the number of professional and technical employees engaged in the project. However, the extent of disclosure of the specific content and progress of a R&D activity may have to be limited in order to protect the program. According to the Statement, a company should disclose the following information:

- The accounting policy should be stated and explained (para. 30.);
- The total amount of R&D expenditure charged to the profit and loss account should be disclosed, analyzed between the current year's expenditure and amounts amortized from deferred expenditure (para. 31). It is emphasized that the amounts disclosed should include any amortization of fixed assets used in the R&D activity;
- Movements on deferred development expenditure and the amount carried forward at the beginning and the end of the period (para. 32); and,
- Deferred development expenditure should be disclosed under intangible fixed assets in the balance sheet statement.

The Articles of Commercial Law require (Schedule 4, para. 20(2)) that research costs must be written off as incurred and that development costs should only be included in a company's balance sheet in 'special circumstances', without explaining what these circumstances might be. So, we conclude that the provisions of the above Statement should be applied. Specifically, development costs, if shown on the balance sheet, must be included as an intangible fixed asset disclosing the following information as notes to the accounts: (a) the period over which the amount of the costs originally capitalized is being or is to be written off, and (b) the reasons for capitalizing the development costs. Distributable profits would have to be reduced to the extent a company carries forward development costs as an asset without the existence of the Statement 'special circumstances'. The alternative accounting rules permit intangible fixed assets, other than goodwill, to be included at their current cost.

The relevant International Accounting Standard is IAS No. 38 'Intangible Assets' which supersedes IAS No. 9 'Research and Development Costs', in 1999. The requirements of this Standard are similar to those of SSAP No. 13, except that: first, it specifically states under what

circumstances<sup>5</sup> an intangible asset arising from development should be recognized. Second, it identifies when development costs once written off should not be reinstated even though the uncertainties, which had led to their being written off, do not exist any more.

The IAS No. 38 does not provide extensive definitions of the different types of R&D<sup>6</sup> cost as well as any distinction between 'pure' and 'applied' research as does the British Statement. However, it offers examples of activities typically included in R&D.

According to the guidelines of International Statement, R&D should comprise all costs that are directly attributable to these activities or can be allocated on a reasonable and consistent basis, to creating, producing and preparing the asset for its intended use. Examples of such costs are furnished in para. 54 of the Statement:

- Salaries, wages and other employment related costs of personnel engaged in such activities;
- Expenditure on materials and services used or consumed in generating such activities;
- Any expenditure that is directly attributable to generating the asset, such as fees to register a legal right and the amortization of patents and licenses that are used to generate the asset;
- The depreciation of property, plant and equipment to the extent that these assets are used for R&D activities; and
- Overhead costs, other than general administrative costs, related to such activities. These costs are allocated on the bases similar to those used in allocating overhead costs to inventories (IAS No. 2).

However, costs incurred to maintain production or to promote sales of the existing products, costs of routine or periodic minor modifications, production lines, manufacturing processes, as well as expenditure on training staff to operate the asset, promotional costs of market research activities, are excluded from the costs of R&D (AAA, 1998).

Contrary to the British Statement, the IAS No. 38 stipulates all the companies should disclose in their financial statements (para. 107):

- The accounting policies adopted for R&D costs;
- The amount of R&D costs recognized as an expense in the period;

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<sup>5</sup> IAS No. 38, para. 45: "An intangible asset arising from development...should be recognized if, and only if, an enterprise can demonstrate all of the following: (a) the technical feasibility of completing...so that it will be available for use or sale; (b) its intention to complete the intangible asset and use or sell it; (c) its ability to use or sell the intangible asset; (d) how the intangible asset will generate...future economic benefits... (e) the availability of adequate technical, financial and other resources to complete the development and to use or sell...(f) its ability to measure the expenditure attributable to the intangible asset during its development reliably".

<sup>6</sup> IAS No. 38, para. 7: "...Research is original planned investigation undertaken with the prospect of gaining new scientific or technical knowledge and understanding. Development is the application of research findings or other knowledge to a plan or design for the production of new or substantially improved materials, devices, products, processes, systems or services prior to the commencement of commercial production or use".

- The amortization methods used;<sup>7</sup>
- The useful lives<sup>8</sup> or amortization rates used; and
- A reconciliation of the balance of unamortized development costs at the beginning and end of the period, showing: development costs recognized as an asset or as an expense or allocated to other asset accounts or written back (Tax Policy, 2004).

In the US, the principle standard which deals with the discussed issue is SFAS No. 2 'Accounting for Research and Development Costs'. This standard has been amended by SFAS (1985) No. 86 – 'Accounting for the Costs of Computer Software to be Sold, Leased, or Otherwise Marketed' and by SFAS (2001) No. 142 – 'Accounting for Goodwill and Other Intangible Assets'. In the present contented form, the Standard made no distinction between 'pure' and 'applied' research.<sup>9</sup> However, a more detailed definition of 'development' (para. 8) is provided. The term 'development' is meant for the transformation of research findings or other knowledge into a plan or design for a new product or process or for a significant improvement to an existing product or process, whether it is intended for sale or use. So, it includes the conceptual formulation, design and testing of product alternatives, construction of prototypes and operation of pilot plants. On the other hand, it does not include routine or periodic alterations to the existing products, production lines, manufacturing process and other on-going operations, even though those alterations may represent improvements. Furthermore, it does not include market research or market testing activities.

The US standard, like the previous ones, provides examples of activities that would normally be included in R&D and those that would not. In addition, the standard identifies elements of costs which shall be identified, among others, with the R&D activities, such as (para. 11): materials, equipment and facilities, personnel, contract services, indirect costs, etc.

The accounting practices required by the standard are summarized hereunder:

- Expenditure on market research is not considered as a cost (para. 12).
- The costs of materials, equipment and facilities that are acquired or constructed for R&D and that have alternative future uses should be capitalized and the cost/depreciation of such material, equipment or facilities used in those activities accounted for as R&D costs, SFAB No. 86, para. 3). However, if the material, equipment, facilities or intangibles acquired for the specific R&D project have no alternative future use beyond the project for which they have been acquired, their cost should be classified as R&D, upon acquisition.

<sup>7</sup> IAS No. 38, para. 89: "A variety of amortization methods can be used...the straight-line method, the diminishing balance method and the unit of production...The method used...is consistently applied from period to period, unless there is a change in the expected pattern of consumption of economic benefits to be derived from that asset...".

<sup>8</sup> IAS No. 38, para. 79: "The...intangible asset should be allocated on a systematic basis over the best estimate of its useful life...will not exceed 20 years from the date when the asset is available for use...".

<sup>9</sup> SFAS No. 2, 'Accounting for Research and Development Costs', FASB (1974), October, para. 8: "...Research is the planned search or critical investigation, aimed at discovery of new knowledge with the hope that such knowledge will be useful in developing a new product or service or a new process or technique or in bringing about a significant improvement to an existing product or process...".

- All R&D costs should be written off at the time they are incurred (para. 12).
- All costs incurred to establish the technological feasibility of a computer software product which is to be sold, leased or otherwise marketed are considered as R&D costs and should be charged to expense as incurred (SFAB No. 86, para. 3).

The main difference in accounting treatment of R&D costs between the British statement and the standard of the US is that the latter requires all these types of costs encompassed by the standard should be charged as an expense when incurred (Pereira *et al.*, 1994). The reasons are: (a) uncertainty of future benefits; (b) lack of causal relationship between expenditure and benefits; (c) R&D does not meet the accounting concept of an asset; (d) matching of revenues and expenses; and (e) relevance of resulting information for investment and credit decisions.

Another difference is that all companies, under the rules of SFAS No. 2, are required to disclose the total R&D costs charged to expense in each period, whereas SSAP No. 13 includes certain types of enterprises. Also, when an enterprise has entered into a contract to undertake R&D for other companies on the understanding that repayment of any of the funds provided by the other parties depends solely on the outcome of the R&D having economic benefit, should disclose (Dodge, 1992): (a) the terms of significant agreements relating to the R&D arrangement, including purchase provisions, license agreements, royalty arrangements and commitments to provide additional funds; and (b) the amount of R&D costs incurred and compensation earned during the period for such R&D arrangements (Deloitte Touche Tohmatsu, 2003).

Theoretically, the accountant is expected to provide the most useful information to society in terms of costs and benefits. However, the measurement of these costs and benefits are very difficult and complicated. Currently, what we can do is to offer qualitative evaluations of alternatives, rather than explicit measures (Ginoglou *et al.*, 2008).

## Reality of R&D Reporting

The valuation of R&D costs for reporting purposes depends upon the reporting objectives and concepts applied. If the objective is to measure and report the individual assets of the firm for each period, the only alternative is to measure the value of the company as a whole and subtract from this value the valuation of other specific net assets (Tahinakis *et al.*, 2006). However, if the objective is to measure and report specific assets in order to provide the users of the financial statements with an indication of the resources available to the company, an independent measurement of the intangibles might be desirable (Ginoglou *et al.*, 2008).

The R&D departments have become particularly important parts for a company due to their functions: development of new products, improvement of present products, testing of competitors' products, development of new or improving the existing servicing methods, development of new and special infrastructures (soft or hard or, as in many cases, both), testing of services and 'pure' research in the area of core business corporate activities (Chan *et al.*, 1990).

Analysis of R&D costs requires careful examination of all activities of the company. In general, companies undertake R&D in the hope of future benefits. The knowledge gained is

either an asset for the company or an increase in the value of the existing assets. The return on capital employed will only give a true measure of the profitability of the company if deferred development expenditure is included in the capital employed (Samuels *et al.*, 1992; and Tahinakis *et al.*, 2006). Also, it is a common practice to capitalize patent rights acquired by (participation or related transactions with) other companies and the company products, which are subject to the patent rights, usually involve some development costs. Thus, according to the matching concept, the R&D costs should be capitalized, as with any other fixed asset and amortized over the period benefitted. This is where a company enters into a business contract, either in order to carry out development work on behalf of third parties on such terms that the related expenditure is to be fully reimbursed, or to develop and manufacture at an agreed price which has been calculated to reimburse expenditure on development as well as on manufacture. The annual depreciation charge will be included in the profit and loss account as part of the expenditure on R&D (Schiff, 1976; and Hendriksen and Breda, 1992).

The inherent difficulty in the capitalization and amortization methods lies in the high degree of uncertainty associated with the useful life time of such expenses. First, the corporate management would be required to assess the expected revenue benefit to be generated and its expected duration (Bierman and Dukes, 1975). Then, it would need recognition of the risk of failure, considering whether:

- A salable product would, in fact, be produced. This condition makes it clear that development expenditure should only ever be carried forward in respect of individual projects. Some accountants argue that the accounting treatment of R&D should be determined by looking at the overall position of a company's R&D activities and that, if there is a high probability that the future benefits will exceed the R&D costs, the whole amount should be deferred, regardless of the position of individual projects. This approach was also rejected by FASB, which argued that a meaningful method of amortization would not be developed because the period of benefit could not be determined.
- Any proposed project which could not be finally materialized, for any reason. Therefore, only when the project is successfully finalized at a future date, should its associated costs be capitalized and amortized.

An alternative to full capitalization and amortization is the case of capitalizing only R&D costs that relate to specific projects, e.g., a research laboratory with all its equipment, with expected net revenue contribution streams. A prerequisite for this case is all R&D costs may be capitalized. In all other cases, costs are to be expensed (Hirschey and Weygandt, 1985).

In addition, all R&D costs when incurred due to the uncertainty of future benefits and/or lack of causal relationship between R&D expenditures and benefits should be charged to expenses. It is also based on the lack of interpretation of the assets (arising from capitalization of expenditures), in case the value of specific future benefits is not reflected. If such benefits exist, their value is not measurable (Johnson, 1976; and Szewczyk *et al.*, 1996).

It is also argued that R&D expenditures have considerable risks, stemming from a high probability of project's failure. This means that companies have to consider the minimization of uncertainty that could be undertaken by pursuing a portfolio of R&D projects. The most important question is: What will be the probability of making a profit from the portfolio of projects and not from an individual project itself? Since a company does not know in advance which of the projects will be successful, the appropriate cost of finding the successful projects is the total cost of pursuing the portfolio of projects (Huefner and Largay, 1998). On the other hand, there is some kind of uncertainty over future benefits for every asset recorded on balance sheets. Applying to R&D, there is a high degree of uncertainty associated with investments in long-lived plant and equipment, especially in the fields where the assets are extremely specialized in nature and where there is rapid technological advance (Tahinakis *et al.*, 2006).

Empirical research provides support to the argument that R&D efforts do really produce benefits for the firm. It is also true that there is high variance of benefits from R&D expenditures without that implying a higher risk. Applying the capital asset pricing model, the important measure of risk is the convertibility of expected return between the individual project and the overall portfolio of securities (Orace, 1976; and Potts, 1998). Expenditures on R&D to develop new products or improve the already existing ones, are likely to be less correlated with market returns. Thus, it seems likely that many R&D expenditures will have relatively desirable risk characteristics, compared to expenditures in physical capital. Therefore, it is incorrect to conclude that, due to lack of observing significant correlation between expenditures and subsequent benefits, future benefits are not generated by R&D expenditures (Tahinakis *et al.*, 2006).

An immediate write-off may result in lower net earnings, return on capital employed and share price and thus, makes a company more vulnerable to the threat of a hostile takeover bid. In addition, company managers are very concerned with earnings per share, as these numbers are used in the investment decision process. Also, the immediate write off yields a greater incentive under stable prices and addresses the problem of inflation by limiting its impact to the year of acquisition of the asset (Gridley, 1974; and Bontis, 2002). Moreover, it offers the chance to replace and expand capital equipment superior to those currently available and addresses the problem of investment capital shortfall. However, the expenditure on R&D, which is made in the expectation of reaping benefits in future, should not be written off against the revenues of the present period.

Until now, in the accounting methods discussed, the problems arise, mainly, from premature predictions of R&D results, based on insufficient information. This situation could be corrected if the R&D costs, during the research period, were accumulated by a project in a contra-equity account and the decision to capitalize or write off was deferred until the major uncertainties were removed by definite events. Accumulating R&D costs as incurred in a contra-equity suspense account perpetually, would create, probably, less errors than would the other debit alternatives, because subsequent identification of individual project results would eliminate predictions based on premature presumptions of project results. As R&D projects are completed or abandoned, the contra-equity account should be credited. The debit part of this event description would be, either to retain earnings if the R&D project is a loss, or to an asset, if an exchangeable form of

future benefits have resulted from the research (ICAEW, 2002). By analogy, a contra-equity account for R&D would be debited perpetually for costs as incurred. Subsequently, the contra-equity account would be credited on the basis of results from individual projects.

However, when deciding which costs are separately identifiable, it is necessary to consider how a project is defined. It is frequently found that certain developmental work is common to more than one main project. It is then necessary to decide whether such work is in the nature of general developmental work. In such cases, the costs should be written off when incurred or, it should be allocated among the projects; in this case carrying forward of the costs will depend on those projects. Or, it should be treated as a separate project in its own right.

The choice of an appropriate accounting treatment for R&D expenditure focuses on the application of fundamental accounting concepts (Milburn, 1968; and Meyer, 1985). The prudence concept, by which revenue and profits are not anticipated but are recognized only when realized in the form either of cash or other assets the ultimate cash realization of which can be established with reasonable certainty. It is an inference of the prudence concept that expenditure should be written off in the period in which it arises, unless its relationship to the revenue of the future period can be assessed with reasonable certainty.

## The Proposed Approach

This study proposes a new approach that integrates both method and practice for the accounting and reporting on intangibles, that build on the concept of Intellectual Capital (IC) and IC Management (ICM), which are crucial factors in defining the success or failure of the modern enterprise. The study proposes to:

- Evaluate reporting methods and performance measurements for the accounting of existing intangibles;
- Analyze the strengths and weaknesses of each of these parameters; and
- Establish a framework for their application (e.g., within practical business systems).

In the light of the above, this study concerns:

- Development of a common trans-European repository of learning processes on the subject field of accounting techniques and tools that enable modeling and analysis of emerging IC patterns, followed by the necessary ICM strategies and practices, and
- Application of these tools to build an understanding of the critical tradeoffs and alternatives that occur in practical corporate contexts, leading to new approaches that should result in quantum enhancements of enterprise performance.

At the heart of this new thinking is a growing body of evidence revealing that reliance on financial measures alone will critically undermine the strategies leading-edge companies must pursue to survive and thrive in the long-term (Sadavage, 2000). As Baruch Lev, Professor of Accounting and Finance at New York University's Stern School of Business, argues: "To claim that tangible assets should be measured and valued, while intangibles should not—or could not—is like stating that 'things' are valuable, while 'ideas' are not".

The comments and findings mentioned above and also from others, (Sveiby, 1997; Edvinsson and Malone, 1997) indicate that there is a relationship between intellectual capital performance and business performance. The International Federation of Accountants defined an Intellectual Capital Framework, based on the work of Edvinsson and Malone (1997), that comprises human, customer and organizational components (Hussi, 2004).

The study carried out by Ernst and Young has two major connotations:

1. "...non-financial indicators can be used as leading indicators of future financial performance".
2. "...all non-financial criteria are fed by performance, and in turn, feed the perception of performance".

Thus, traditional ways of 'measuring' a company do not necessarily provide indications of future performance; the non-financial (or intangible) indicators provide more reliable information on the future health of the organization.

The changing economy—in particular, the impact of the Internet and acceleration of timescales—has led to the need for correspondingly enhanced and more reliable financial reporting approaches.

Companies are now evolving ever faster as they become enmeshed in an ever more complex network of alliances, virtual networks, joint ventures, partnerships and other related entities. Furthermore, they increasingly extract their value and growth primarily from intangible assets, such as innovative organizational forms, brands, know-how, patents, etc., in a way that was previously only vaguely understood. This holds for small and medium sized enterprises as well as big players; though, especially in the latter case, the inefficiencies that they face grow in proportion to their size, thus limiting their growth.

The terms 'intangibles', 'intangible assets', 'knowledge assets' and 'intellectual capital' are all used by different groups of professionals to describe basically the same thing, i.e., the knowledge and corporate relationships that are so important for success; indeed more important today in many cases than physical assets (Kmeurope, 2006). However, the elementary linkage between intangibles and the focus on knowledge is still often overlooked as is the role of the learning process in value creation. In fact, a surprising number of experts within the accounting discipline ignore the elementary linkage between intangibles and the focus on knowledge, missing also the importance of the basic operation that helps value creation, viz., the learning process.

At present, we face a paradoxical situation. On the one hand, accountants are desperate to develop approaches to valuing intangibles to increase their relevance, while on the other, we note the urgency with which the regulators want to introduce the ungrounded approaches to intangibles.

In the research literature, three generations of IC practices can be identified:

1. The first generation mainly concerns scorecards, like Skandia,
2. The second generation employs IC indexes which focus on resources, as well as transformations, and

3. The third generation which focuses on an Holistic Value Added (HVA) approach.

Generally speaking, Intellectual Capital Management (ICM) offers many beneficial opportunities, as can be testified by the firms that have deployed them in a professional way.

We also see that organizations err in the way they conceptualize and implement ICM. Three of the most common mistakes companies make are:

1. To focus on the presence of resources (“how much of something do we have?”), rather than the transformation of resources (“for what are we using that which we have and how well are we extracting value from this use?”).
2. To employ tools and techniques that do not ensure that the items identified are complete (i.e., tools that miss something important to the firm) and preference independent (i.e., tools that use attributes that impact each other or overlap). Falling into this trap means that the outcome is unreliable and does not have any predictive power.
3. To assume that everybody values the same thing. This is most obvious when management assumes that investors share their views on what should be done to improve the firm’s value. An insightful approach here makes it possible for the management to balance the need to communicate (by persuading investors to change their views) with the need to perform (giving investors what they want).

## Plausibility of the Approach

The entire edifice of financial reporting and audit of publicly listed companies is a pragmatic creation, born of political economy. It is a residual legal artefact of the historical opposition between corporations that do not want to disclose, and shareholders who require degrees of disclosure. As such, this statutory reporting edifice has no reliable compass and is arbitrary. (Nobody is going around deconstructing the two-column trial balance or questioning its accuracy as a model of commerce). What we are really modeling (to use the ‘classic’ notion of an accounting system) is a sequence of transactions in terms of a historical trail of events.

Having experience with the domain of accounting software, we have identified the following. In the same way that a company uses a specific model for reporting its activities and for documenting its transactions with trading partners (viz., that of classic double-entry accounting), there is an equal need to identify a system that describes decision making activities—the majority of which build on (elementary) information management transactions.

Accounting of intangible and all forms of directly related business processes, may really be viewed as a representation or a set of symbols, for some underlying reality. Obviously, one has to consider terms, such as ‘alternative’, ‘choice’, ‘option’ and names of certain actions throughout the system, for which meanings are not ambiguous. One also has a lot of structures representing relationships and hierarchies, which are more subtle.

Like all systems of notation and semantics, accounting of intangibles can never be anything but a model. It is a map to a territory, whose validity may be evaluated by reference to that underlying reality in the ‘real world’ (Roberts and Koumpis, 2003). A basic argument we face

is to reconsider the intangibles accounting process from a new perspective. Companies traditionally use classic double entry accounting as their basic operational mode for their bookkeeping operations and this now currently faces serious limitations due to the highly networked nature of the economy, in general, and the business-to-business transactions amongst trading parties, in particular. Similarly, there is a long-felt need to reconsider the reporting foundations for intangibles accounting, as well as the related business decision making process.

A growing number of academics, consultants, and regulators see the absence of most intangible assets from the books as a major deficiency in the existing accounting 'regime' (Sveiby, 1997). They argue that such assets increasingly drive the value of corporations, and yet currently receive no recognition in financial disclosures. In an increasingly competitive, knowledge-based economy, intangible assets, such as brand awareness, innovation, and employee productivity, have become the key determinants of corporate success. Given the investments that companies make—such things as corporate infrastructures for knowledge management, employee training, and R&D—to build those intangible assets and the fact that they are 'flushed' through the balance sheets means the books increasingly become a poor reflection of the true value of companies' businesses.

Corporate executives, however, see more to lose than gain from increased transparency. Intangible assets essentially represent the secrets of a business enterprise—the key resources and factors that enable it to compete effectively in the market (Sprouse, 1970). If the company shares those secrets with investors (and with competitors), it could hasten the erosion of the value of those very intangibles. Furthermore, the added transparency could open up whole new avenues of attack for a plaintiff's lawyer. If corporate disclosures of intangible values prove wrong—and it is easy to be wrong about intangible values—shareholders will have plenty of ammunition for lawsuits (Taub, 2009).

## Conclusion

R&D work to date has mainly focused on analyzing the impact of information exchange on information 'supply-chain dynamics' (Souza *et al.*, 2000). One interesting outcome of the study was a characterization of situations where individual corporate information suppliers must share information to remain competitive.

When an accountant records R&D expenditure, there is always the risk that a later development might show that the recording was not correct. In such cases, the asset value may turn out to be much less than the purchasing cost. Therefore, the solution is to expense all costs associated with the acquisition of assets. This 'conservative' approach completely ignores the types of errors, such as income misstatement, asset understatement and stock equity understatement, that arise from expense overstatement. Therefore, the accounting procedures should be flexible to deal with future uncertainties. The R&D expenditures should not be written off against the revenues of the present period.

The major problems of managing heterogeneous corporate information sources in organizations in which our approach is implemented, can be summarized as:

- Insufficient modeling and understanding of the source data located in various sites across the organization, due to lack of a common terminology and documentation, differing implementations of reporting infrastructures, and source data not being placed in the context of the dynamic aspects of the organization.
- Difficulty in organizing *ad hoc* processing of such information, making users (corporate management, shareholders, internal and external auditors, etc.) dependent for their information needs on information resource management departments with the usual shortcomings of this approach (relatively limited reliability of the provided information, need for authentication, etc.).
- Lack of facilities for maintaining these resources, thus making more difficult the task of keeping the various systems in line with the ever-increasing rate of change in modern business organizations. ■

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