# “The evaluation of intangibles: introducing the optional capital”


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# The evaluation of intangibles: introducing the optional capital


## Abstract

This article discusses well-accepted approaches as well as the option pricing method applying to the financial evaluation of "intangibles" that includes intangible assets and intellectual capital. Even though "traditional" approaches such as the cost methods, the market valuation methods or the income method might be customized to be applied to intangibles, they ignore their flexibility that is frequently embedded in. The main contribution of this article is to set intangibles' evaluation in three dimensions including *assets*, *knowledge and options*. It suggests broader measures, methods, and opens research perspectives.


**Keywords:** intangibles, evaluation, intangible assets, intellectual capital, real option.
**JEL Classification:** G30, M41.

## Introduction

From "Economic Concepts of Human Capital" (Lev & Schwartz, 1971), "Mobilizing Invisible Assets" (Itami & Roehl, 1987), "Brainpower" (Stewart, 1991), the "Invisible Balance Sheet" (Sveiby, 1997), to "Value Driven Intellectual Capital" (Sullivan 2000) or "Classification and Measurement of Intellectual Capital Entities" (Mouritsen, 2009) for example, intangibles are no longer sole accounting objects. Intangibles do not only mean intangible assets as identified in accounting standards. Intangibles also refer to knowledge assets, intellectual asset, human capital and intellectual property (Lazonick & Sullivan, 2001). Among them, two concepts seem to weave through the literature: intangible assets and intellectual capital.

The evaluation of intangibles starts in Section 1 with their identification through the concepts of intangible assets and intellectual capital. Section 2 explore and discuss well-accepted accounting methods. Section 3 advocates for the use of option pricing method for the evaluation of intangibles and introduces the concept of the "optional capital" suggesting an expanded frame for their evaluation and new paths for future research.

## 1. Defining intangibles through intangible assets and intellectual capital

The Financial Accounting Standard Board (FASB) exposure draft, applying to business combinations and intangible assets offers: "*Intangible assets are non-current assets (not including financial instruments) that lack physical substance*". Much complete, a generic definition (Andersen, 1992) states intangible assets (I.A.) "*generally arise as a result of past events and possess three main attributes: they are non-physical in nature, they are capable of producing future economic net benefits, and they are protected legally or through de facto rights*". The Organisation for Ecomomic Cooperation and Development (OECD) gave a similar definition of the intellectual capital in 2008. A broader approach (Intangibles Research Center at New York University) gives: "*Intangibles are non-physical sources of probable future economic benefits to an entity or alternatively all the elements of a business enterprise that exist in addition to monetary and tangible assets*". The International Accounting Standard through (IAS 38) describes under what conditions I.A. should be *recognized* in the financial statements. "*The asset should be identifiable, controlled and clearly distinguishable from an enterprise's goodwill. The future economic benefits attributable to the asset will probably flow to the enterprise; and the cost of the asset can be measured reliably*". IAS 38 frames the accounting recognition of I.A., but it does not qualify them from an economic perspective, and does not say what is indicative of their value.

The approach of Reilly & Schweihs (1999) is interesting in its clear distinction between economic existence and economic value to evaluate I.A. I.A. have *economic existence* if they should be identified, protected legally, and possess a right of private ownership that should be transferred to a new owner (Van der Walt, 2007). Nevertheless, economic existence does not mean that an I.A. has *economic value*. For example, a registered trademark, which is not used in the production of income, has economic existence throughout its registration period but does not have economic value and cannot be considered as an I.A. Its value attribute should generate some measurable amount of economic benefit to its owner. Thus, it should potentially enhance the value of a pooling of other assets. To that extent, a registered trademark which does not produce any income but is used as a barrier to entry may have economic existence as well as economic value. A definition of intangible assets should state that they are non-physical in nature, specific to a business, and do possess economic existence as well as current – even if, it is indirect – economic value.

The concept of intellectual capital (I.C.) is historically attributed to John K. Galbraith that focused "*on dynamic constituents of assets that added value in their use to business requirements*". Nevertheless, one of the first and most complete structured descriptions of I.C. is due to the foremost suppres Chief Knowledge Officer Edvinsson at Skandia Corporation. For Edvinsson & Malone (1997), intellectual capital is human, structural, and customer-based. From a valuation point of view, Sullivan (2000) gives a succinct definition of the intellectual capital. It is "*knowledge that can be converted into profit*". Connecting intellectual assets with strategy is crucial. Stewart (1997) considers as a "vital lesson" that knowledge assets "exist and are worth cultivating only in the context of strategy". For Brooking (1996; 1998), "I.C. comprises intangible assets to include market, intellectual property, infrastructure and human asset"; this developmental knowledge that needs to be aligned with the corporate strategy.

A global definition of intangibles should include an asset base mainly made of intellectual property and a knowledge base representing the intellectual capital.

## 2. Evaluating intangibles through "traditional" approaches

The evaluation of intangibles is a topic of great debate. Beyond trends (Bouteiller & Ruiz, 2001) and management fashion (see Fincham & Roslender, 2003, for a sharp discussion), many authors criticize present approaches and point out the disconnection between the book and the stock value (see among them: Sveiby, 1997; Roos et al., 1998; Lev, 1999). They relate it to the incapacity of accounting and financial methods to capture the value of intangibles and their unpredictable change (Bancel & Rebiscoul, 2007). For Lev at Stern New York University (NYU) (reported by Webber, 2000) there is a real conflict between "knowledge assets" and the old laws of accounting. This situation is mainly due to accounting practices and strong resistance to change the current system. The solution which strongly supports the Canadian Institute of Chartered Accountants might be "not to do away with the old system, but to improve it by looking outside the existing system and developing complementary tools".

Under those circumstances, what is the actual applicability of "well-accepted" accounting methods to the evaluation of intangibles? What are the most worthy intangibles: present and actual intangible assets and intellectual capital or their related portfolio of opportunities? I will discuss first "traditional approaches" including cost, market and incomes methods then introduce an "optional" approach in Section 3.

**2.1. Cost methods.** They are classical ways for intangibles' individual appraisal. Among them, several related analytical techniques (creation/recreation, historical/prospective, reproduction/replacement, avoidance cost, edc) are relevant for their evaluation. However, the most common are the reproduction cost (i.e. for an exact replica) and the replacement cost (i.e. for an intangible asset with equivalent utility). The reproduction cost and the replacement cost provide a "reasonable" measure of the value of intangibles when two conditions are met. The first one is to include all the cost components of the intangible; the second one (unless it is brand new) is to reduce it for all forms of obsolescence (Reilly & Schweihs, 1999).

Aggregating all the cost components is the trickier step when it applies to intangibles because they are resulting from multiple and accumulated expenses and are often united to tangible assets. The common way takes into account materials, labor and overheads. It must also include the developer's profit and an *entrepreneurial incentive* which are delicate to appreciate for intangible assets regarding their more often fuzzy nature and their associated uncertainty. Choosing the right costs of reference also arises questions. Historical costs may be objective, consistent and reliable, but suffer from practical limitations. There is often a lack of relevant information for older intangibles. Expenditures incurred in maintaining the value of an intangible asset and investments in enhancing its value can not be differentiated. The historical cost reflects a particular state of prices on a market and adjustments should not reflect current prices. The main strength of the replacement and recreation costs is to surmount this difficulty. Therefore, they do not fix the problem of the present required costs of recreating the intangible. Intangible assets are associated with a history that largely determines their attributes. Those could be currently impossible to replicate and some intangible assets might be irreplaceable (Andersen, 1992).

Identifying and measuring obsolescence is also an acute operation in order to estimate the value of an intangible asset. The common forms of obsolescence include functional, technological and *external obsolescence* (location and economic related obsolescence). Their measurement requires a particular care, in order to separate obsolescence related to the intangible asset from the associated tangible asset, and to use only the obsolescence related to the intangible. Qualitative methods, such as the "life cycle analysis" and the "remaining useful life" (Nelson, 1982; Ellsworth, 1992; Fuller, 1994) can assist in appreciating the obsolescence of an intangible. For example, the ratio of the effective age of an intangi-

ble to its expected life[1] represents one measure of obsolescence. The main limit of costs related methods lies in their fundamental and implicit assumption that expenditures should always create value[2]. This assumption (Andersen, 1992) "may be untenable given the variable success of new intangible assets (e.g., brands) brought to the market". This is why the evaluation of intangible assets might also use market or income approaches.

**2.2. Market methods.** Market methods estimate the market value of an intangible asset by comparing it to similar intangibles that have been licensed or sold in recent times. Market approaches include[3]: the sales transaction method[4], the relief from royalty method[5], the comparative income differential method[6], and the market replacement cost method[7]. Even if their implementation depend on available information and reliable transactional data, those methods represent the most direct and efficient approaches to the valuation of intangibles. Their practical application (Andersen, 1992) do have some limitations due to the following several factors: (1) most of intangibles are not sufficiently traded to determine a comparable market value; (2) they are more frequently traded with a business including tangible assets and are difficult to dissociate from; and (3) they may be unique and similar transactions do not exist. In addition, market cycles, or purchaser's special interests, such as strategic or competitive premiums, may introduce distortions. Because of these, analysts consider adjustments on those factors as "vital" for making the market approach relevant.

The most applicable standard of value in market approach is the "fair" market value that has been confirmed with the work of Barth & Clinch (1998) on a sample of 350 Australian firms from 1991 to 1995. When selecting and analyzing guideline sales or license transactions, the following elements (Mullen, 1993; Smith, 1994; Battersby & Grimes, 1996; Reilly & Schweihs, 1999) usually require careful consideration: appraisal of the property rights, motivations to the transaction, financing terms, market conditions, size, attributes, and economic situation at the time of sale. The market value is usually given by the application of a multiple to the price of the guideline transaction, or the application of some relevant variable coming from: the guideline transaction's financial statements, the market potential, or projections of future earnings. Their choice may appear subjective, such as the different elements of comparison seen above. Those are often especially difficult to collect for intangible assets, regarding their unique character and their possible lack of marketability. They represent harsh difficulties when implementing market approaches.

**2.3. Income methods.** This methods can be grouped into two categories: the yield capitalization method and the direct capitalization method. The first one calculates the present value of a non-constant stream of projected economic income flows over a discrete time period. The second one capitalizes a constant or constantly changing stream of economic income flows, over a specific time period. Income approaches are adaptable to virtually any type of intangible. They are possibly among the most accurate and controlled evaluation's methods. They require however (Reilly & Schweihs, 1999) to consider all the critical economic variables associated with intangibles including: (a) the income generating capacity; (b) the expected remaining life of the intangible; and (c) the appropriate cost of capital for an investment in the intangible asset, and the risk associated with the intangible. All of these variables are considered implicitly in the other methods, but need to be explicitly addressed in the income methods.

The income's allocation between the intangible asset and the associated tangible asset is a prerequisite to the measurement of the income generating capacity. Another important step for a consistent evaluation is to identify clearly the origin and the production mechanism of the income. The potential sources of incomes of an intangible asset are the same than tangible ones[8] and may occur through the use, ownership or forbearance of use of the intangible. License agreements are typically illustrating the different incomes coming from their respective use or ownership, and are quiet easy to measure. Forbearance of use (but ownership) of a trademark, patent or technology for defensive purposes[9] does generate indirect incomes but are much more problematic to evaluate.

[1] Based on the assumption an intangible asset gives up some of its value when generating economic value.
[2] Intangibles don't create value when they stand alone but when they associated with other factors (Executive education and information (Lev & Daum, 2004)).
[3] It excludes rules of thumb that seem quite obscure and too much specific to industry valuation "formulas".
[4] Based on actual market transactions.
[5] Based on the royalty income the intangible would generate if the intangible was licensed in arm's length transactions.
[6] Based on the comparison of the income produced with and without operating the intangible.
[7] Based on the estimate of the replacement cost of the intangible by knowledgeable outsiders or external expertise.
[8] They derive from increases in revenues, decreases of expenses and decreases of investments.
[9] For example the protection of other intangible assets or competitive position.

The correct appreciation of the expected remaining life of the intangible is a second tricky issue. This is especially important when applying yield capitalization methods, but also true for direct capitalization methods implementation. The number of periodic income flows to be projected depends on the length of the time period of the evaluation. This is why life analysis must be used and the remaining useful time of the intangible asset must be estimated. According to Dandekar & Cowles (1987) and Reilly (1991), the value estimation of incomes depends on the duration of the life period. For instance, the conclusion of the income method is very sensitive to variations in remaining useful life when the life estimate is under ten years, and has no effect when the life estimate is above twenty years. Some quantitative analysis may help defining the appropriate life characteristics of an intangible. For example, customer-related intangible assets can perform actuarial techniques such as survivor curves analysis, if age data on customers or contracts renewal are available. According to Reilly & Schweihs (1999), the most common types of standard survivor curves functions used in the intangible asset remaining life analysis are the "Iowa-type Curves", the "Weibull Distribution" (Ellsworth, 1994), the "Gomperz-Makeham Curves", and the "Polynomial Functions". It is clearly out of the scope of this paper to discuss each of them. We should stress the importance of two points for their implementation. First, the maximum lifespan of any kind of survivor curve is required in order to determine the number of periodic incomes coming from the intangible. Second, the amount of periodic incomes should be estimated on the basis of the surviving percent of the survival curve.

The choice of appropriate capitalization rates is a third important issue in the application of income methods, even if there is no radical difference when applying to intangible rather than to tangible assets. There are two kinds of capitalization rates: yield capitalization rates and direct capitalization rates. Both of them should include to the extent possible: (a) market-derived data; (b) forward-oriented data; (c) risk appreciation; and (d) consistency with the measure and the term of income stream. The multiplicity of the variables involved in income approaches may make them heavy to process, particularly when the income – or a part of it – is indirect.

The most serious limitations that are widely sharing the cost, market or income approaches lie in their static way to think intangibles as they are not in nature (Bart et al., 2001). Traditional asset by asset methods do not evaluate (unless indirectly with rules of thumb or discrete adjustments) intangibles through the risks/opportunities that are embedded in them. Those correspond very often to the most important part of their value, if not to their whole or sole value. Because of, we explore next and strongly advocate for the optional approach in the evaluation of intangibles.

## 3. Why an optional track?

The option pricing method represents a relatively new path for the evaluation of intangibles. Myers (1984) has been the first to recommend the application of the option-pricing theory (Merton, 1973; 1998) to the valuation of a particular intangible asset that was research and development (R&D). He states the discounted cash flows method (DCF) is of "no help at all" and "the value of R&D is almost all option value". Kaplan (1986), through investments' cases, concluded that DCF methods were unable to catch the value of "intangible benefits" such as flexibility and learning. According to Baldwinn & Trigeorgis (1993), the solution to under-investment and lack of competitiveness should be found in the management of real options, and Faulkner (1996) analyzing the Japanese investment decisions, advises to apply real option pricing methods for evaluation of R&D investments.

According to Powell (2003) "*While the outcome of the project remains uncertain, the project itself will have a positive value representing the value of the chance that the project will be successful*". Dixit & Pindick (1995) note, that managers need to consider the value of their options open to make "intelligent investments choices" and Nichols (1994) reports a "scientific approach" to finance should consider all business decisions are real options. It is in a "continual redefinition of the opportunities created by the resolution of uncertainty" (Faulkner, 1996), that managers enhance the intangible value of a firm and Luehrman (1997) states opportunities are often the most valuable assets they have. Nevertheless, even if Upton (2001), considers valuation techniques based on real options "*are perhaps the most promising area for valuation of intangible assets*", the point is how to identify and evaluate this "intangible value" represented by opportunities that are real options. Real options generate choice and give a preferred access to future opportunities (Bowman & Hurry, 1993); they also make possible to take into account flexibility (Sick, 1995).

Several conceptual real options frameworks have been presented by different authors such as Kester (1984) Mason & Merton (1985), Trigeorgis & Mason (1987), Trigeorgis (1988) Kulatilaka & Marks (1988), Kulatilaka & Marcus (1991). Copeland & al. (1994) classify real options into four categories: (1) the option to abandon or sell an asset (equivalent to

an American put option on stock); (2) the option to defer its development (equivalent to an American call or put option on stock); (3) the option to expand or contract the scale of an asset (equivalent to an American call or put option); and (4) the option to switch project operations (that is a portfolio of both put and call options).

The recent literature shows many ways to evaluate, under different circumstances, the price of real-options, including several degrees of sophistication. We will not discuss each of them in details. To make a long story short, real options can be evaluated in two ways: separately with the valuation of one type of option at a time, or through their combination when their values may interrelate. In the first case, authors such as Myers & Madj (1990) examine the option to abandon, Mc Donald and Siegel (1986), Majd & Pindyck (1987) or Paddock et al. (1988) investigate the option to defer. Margrabe (1978), Kulatilaka & Trigeorgis (1993) analyze the option to switch. Contributions that can not be ignored come from Trigeorgis (1991; 1993) where each previous type of options are evaluated separately and then in combination.

However, Trigeorgis (1993) draws our attention to the difficulty of numerical techniques[1] – called "the bitter pill" – that are sometimes necessary to describe complex options situations. Concerning one of the well known and direct approaches using the Black & Scholes formula, Faulkner (1996) points out that its perceived complexity and its "often counter-intuitive result" is a barrier to use for most managers. Leslie & Michaels (1998) state that the reason for its apparent neglect may be options theory is "notoriously arcane". Nevertheless, they agree to the fact that the formula can be computed easily, and prove it through comprehensive examples. That is not to say that the Black & Scholes formula should apply to any case, no more than a popular alternative method that is the decision-tree analysis. Each of them shows strengths and limits. Even if the Black & Scholes formula for the valuation of the R&D (Brealey & Myers, 1988) is quite fast and easy, such a simplifying assumption as the future outcomes' uncertainty of research, or development and commercialization operations could be described by a single log normal distribution, is arguable. On the other hand, even if the uncertainty may be customized in any manner with the decision-tree analysis (Herath & Park, 1999) this technique is often heavy to implement, and may generate too large and complex representations. According to Faulkner (1996) there may exist cases where "the structured semi quantitative approach recommended by Sharp (1991) is appropriate".

Beyond the valuation techniques, applying the option pricing approach to the evaluation of intangibles introduces a new insight in the way to conceive, assess and manage them. Faulkner (1996) strongly advocates for an "options thinking" recognizing that uncertainty, when it generates opportunities and limited risks, may correspond to the true and most important value of an investment's project. It is obvious to point out in the actual and present business environment, that uncertainty is almost everywhere and applies to any asset. Intangibles conceived as options on real assets may be *potentially* anywhere.

From our point of view, intangibles are all options on tangible assets, intangible assets and intellectual capital. In this perspective, uncertainty and its associated risks and opportunities might be the present and worthy intangible of a firm, if it generates flexibility. For Trigeorgis (1993) management's flexibility is strategic and operating capacity to adapt actions to environmental changes, "expands an investment opportunity's value by improving its upside potential while limiting downside losses". An 'expanded or strategic' net present value (NPV) of any investment should include: (a) a classical NPV calculated under passive management hypothesis, plus (b) the value of options from active (or adaptive) management. In fact, flexibility might add to any asset – intangible or not – an "intangible value", if the cost of the real option is lower than the benefits it should provide.

There are several works examining advantages in terms of value creation of an "option thinking" (Faulkner, 1996). Kemna (1993) reports three cases of investment opportunities for Shell Company that benefited from applying option pricing techniques. Leslies & Michaels (1998) examine their positive impact on British Petroleum (BP) and PowerGen. Herath & Park (1999) also develop a valuation model incorporating the risk-free arbitrage features of the binomial option pricing model into a decision framework and apply it to the introduction of a new product: the Mach III from Gillette. They demonstrate the value of innovation and its impact on the stock value[2]. Option-pricing approaches are going far further into the problematic of evaluation: options may represent a major part of *the value* of intangibles, such as the flexible – then worthy – part of tangible assets.

[1] The article provides numerous references on the two sets of numerical techniques for option valuation that are, according to Trigeorgis: (1) approximating the underlying stochastic processes directly; or (2) approximating the resulting partial equations.

[2] From September 1997 (when Gillette announced the launch of the Mach, 3) to April 1998 (when the stock of the company had increased 50%.)

## Conclusions and perspectives for future research

Current definitions of intangibles are all assets and knowledge-based. Regarding the global and growing uncertainty of our environment, we think this way to conceive intangibles is uncompleted. Uncertainty is everywhere and may apply to any asset or knowledge capital. Because of this, we think intangibles must include a third dimension, that is optional, and which applies to tangible and intangible capitals. Intangibles are made of assets, knowledge, and options.

This conception of intangibles introduces new paths for their evaluation. Section 3 explored the interest of the option pricing method for the evaluation of intangibles. Applying to the intangible part – which is optional – of any asset or capital, it radically changes the field of intangibles' evaluation. Therefore, we suggest extending the evaluation of intangibles to what we call the *optional capital* of the firm. We represent the *optional capital* as composed of a portfolio of different possible options on intangible assets and intellectual capital but also on tangible and financial capital. These are options to sell or buy, options to expand or contract, options to differ an investment in, and options to switch. As regards ubiquity of options, we place the *optional capital* at the core of our extended model for evaluating intangibles. It interrelates with the tangible and financial capital but also interacts with the three components of intellectual capital encompassing human, structural, and external capital. Our conception of the *human capital* associates employees (which is the traditional human capital described by the literature), to an open network of partners and value contributors close to the conception of the "internetworked human capital" due to Tapscott et al. (2000). Our representation of the *structural capital* is equivalent to the Edvinsson & Malone's framework (1997) and Roos et al. (1998). It includes organizational, process and innovation capitals[1]. The *external capital* includes relationships with customers and suppliers as most of the current and well-accepted representations do, but also covers shareholders relationships, that can deeply influence the market value of any kind of capital.

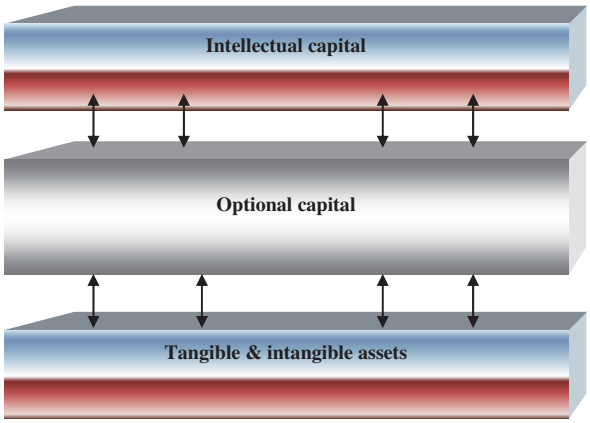


**Fig. 1. A complete evaluation of intangibles including the "optional capital"**

As regards techniques for calculating the optional value of intangibles, we mentioned in Section 3 that the Black & Scholes formula (1973), or the decision tree analysis applied to investments in the three components of intangibles should be appropriate for the most of the cases.

The aim of this article was, at its origin, to explore traditional approaches applying to the financial evaluation of individual intangibles. The preliminary step for the evaluation of intangibles is to give a definition of them. We think now a complete definition of intangibles does encompass the concepts of intangible assets, intellectual capital, and "optional capital". A second step of discussing approaches was made to appreciate their respective contributions. Refine the spotting of intangibles on the basis of their recognition criteria settled by international accounting standards, deepen depreciation's techniques and justify them economically remains necessary. Nevertheless, the financial evaluation of individual intangibles lies beyond assets and knowledge. Expanding the frame to take into account their embedded flexibility leads to consider *intangibles also as options*. In that extend the evaluation of intangibles should appreciate their exercise prices to evaluate their complete economic value.

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[1] Organizational capital includes the firm beliefs and schemes for leveraging the organization's ability. Process capital consists in the plans, techniques and procedures that are executed during the delivery of products and services. Innovation capital, includes (Luthy, 1998) intellectual properties and intangible assets. Intellectual properties are protected commercial rights such as copyrights and trademarks and intangible assets are defined by this author as all of the other talents and theory by which an organization is run.

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