International journal of applied management and economics
Vol : 2 , Numéro 02 , February 2023
ISSN : 2509-0720

Measurement of intellectual capital

Mesure du capital intellectuel

- **AUTEUR 1 :** Mahmoud MERZOUK,
- **AUTEUR 2 :** Oumaima LAYINE,
- **AUTEUR 3 :** Samya BAIDDOU,
- **AUTEUR 4 :** Aya AFANDI,
- **AUTEUR 5 :** Houda BRICHICH,
- **AUTEUR 6 :** Wafaa JAMIL,

(1) : Master's degree student at ENCG Settat, Hassan 1st University, Settat, Morocco

(2) : Master's degree student at ENCG Settat, Hassan 1st University, Settat, Morocco

(3) : Master's degree student at ENCG Settat, Hassan 1st University, Settat, Morocco

(4) : Master's degree student at ENCG Settat, Hassan 1st University, Settat, Morocco

(5) : Master's degree student at ENCG Settat, Hassan 1st University, Settat, Morocco

(6) : Master's degree student at ENCG Settat, Hassan 1st University, Settat, Morocco

Conflict of interest: **The author reports no conflict of interest.**

To cite this article : **MERZOUK .M, LAYINE .O, BAIDDOU .S, AFANDI .A, BRICHICH .H & JAMIL .W (2023) « Measurement of intellectual capital»,**

IJAME : Volume 02, N° 02 | Pp: 011 – 026.

Submission date: January 2023
Publication date: February 2023

DOI : 10.5281/zenodo.7808194

International journal of applied management and economics
Vol : 2 , Numéro 02 , February 2023
ISSN : 2509-0720

Abstract

The economy has greatly evolved and changed in the past decades and still evolving. Companies that used to prioritize tangible assets as the only source of value creation, are now focusing on intangible assets to gain and maintain a significant competitive advantage. The very thing that has stimulated the need of finding methods and techniques to measure this Intellectual capital. From this matter, the purpose of this paper is to present de different methods of measuring intellectual capital. These methods are categorized in four groups:
Direct Intellectual Capital methods (DIC) that evaluate intangible assets through the identification of each of its components, Market Capitalization methods (MCM) that use total market value to assess the value of intellectual capital, Return On Assets methods (ROA) and Scorecard Methods (SC). Each group is composed of multiple methods.

Keywords
Intellectual capital, Intangible assets, Measurement, Value creation, Total market value.

Introduction :

Companies often focus on creating a competitive advantage by optimizing their resources, which means developing resource strategies to be efficient and performant. Therefore, nowadays the key to achieve an added value is to obtain scarce, and valuable resources (tangible and intangible assets), which are different from the competition.

By considering that tangible assets can be the same of the competitors, this drives companies into an increasing need to correctly value the intangible assets or intellectual capital, which is the value of the knowledge, skills and business training of a company's employees, or any unique information that can give the company a competitive advantage. It is also referred to an asset and can be generally defined as all the information resources available to a company that can be used to gain profits, attract new customers, produce new products, or enhance the company. It is the combined expertise of employees, organizational processes and other intangibles that contribute to the company's results.

Moreover, Intellectual capital consists of three elements: Human capital, Structural capital, and Relational capital.

This paper is mainly focused on intangible assets, specifically measurement of intellectual capital in order to evaluate the performance of companies to develop their resources and competencies to sustain profitability.

2 Intellectual Capital

Intellectual capital is the value of the knowledge, and knowledge and information have become the most important raw material of the economy and its most important result (Stewart, 1998), it is also the skills and Business training of a company's employees, or any unique information that can give the company a competitive advantage.

For some scholars, intellectual capital is the difference between the total market of a company and its total book value (Edvinsson and Malone 1997, Sveiby 1997).

It is also referred to an asset and can be generally defined as all the information resources available to a company that can be used to gain profits, attract new customers, produce new products, or enhance the company. It is the combined expertise of employees, organizational processes and other intangibles that contribute to the company's results.

Intellectual capital can be broadly divided into three different types of capital:

- Human Capital: refers to the economic value of a worker's experience and skills. It involves assets such as education level, innovation capacity, intelligence, know-how, health, and other things that employers value, like professionalism, punctuality and loyalty. It is also an intangible asset or quality that does not appear on a company's balance sheet. Human capital is seen as enhancing productivity and increasing profitability. The more a firm invests in its employees, the greater its chances of productivity and success.

- Relational Capital: refers to all the valuable relationships an organization has with its customers, suppliers, partners, consumers and other external actors. It also includes the brand names, reputation and trademarks that a company possesses.
- Structural Capital: Structural capital is the organizational, operational, and innovation capital that supports an organization's human and relationship capital. It comprises procedures nd processes, databases, culture, intellectual property (IP) such as patents and trademarks, non-physical infrastructure, hierarchy. It describes the knowledge and value that belongs to the structure and procedures of an entity

3 Methods Of Intellectual Capital Measurement

3.1 The Direct Intellectual Capital (Dic)

Direct intellectual capital is a method of assessing the worth of intangible assets by defining and evaluating their value (e.g. Technology broker - DIC audit, total value generation, value exploration, quotationweighted patents, future accountancy, etc.).

According to Luthy (1998) and Williams (2000), the DIC assesses the cash value of intangible assets by setting its reference value. The cash value of immaterial resources by defining its different components. Once these components have been identified, they can be directly valued, either singly or in the form of an aggregated coefficient.

It has multiple advantages such as can give a more complete reflection of the health of an organization's than financial indicators and can be easily implemented at all levels of the company. It also measures closer to an event and, consequently, reporting can be faster and more precise than pure financial measures.

In this group we have the following methods:

3.1.1 TECHNOLOGY BROKER

This method was developed by Annie Brooking (1996) and which evaluates the intellectual capital of acompany based on its answer of 20 diagnostic questions about four major components:

Market assets: According on Brooking (1996), market assets are the assets that a company builds throughbeneficial relationships with its market and customers. Such as distribution channels, brands, reputation.

Intellectual property assets: Intellectual property (IP) is an intangible asset that include Patents, copyrights and trademarks are as forms. In other words, the legal rights to protect many of the company's assets

Human-centered assets include the collective expertise, creative and problem-solving capabilities, leadership, entrepreneurial and managerial competencies that employees hold. (Brooking, 1996).

Infrastructure assets are the technologies, methodologies, and procedures that would be helpful to the operation and functioning of a firm.

Brooking claimed that a 20-question questionnaire would help organizations recognize the IC management processes in place and possible areas for improvement in IC management processes.

Also, Brooking (1996) developed multiple audit questions for each element of intellectual capital. The intellectual capital audit process will identify potential weaknesses and strengths of intellectual capital in a specific organization. Based on the audit process, three methods can be used to calculate the monetary value of IC, namely: (1) The cost approach,

(2) The market approach and (3) the income approach.

3.1.1 CITATION WEIGHTED PATENTS

Citation-Weighted Patent method considered one of the most transparent methods, for its simplicity to be understood and easiness to be followed up. And back to its very first reasons of creation, which was developed by the company DOW chemical, DOW chemical was a well-known company for utilizing a number of legally protected a indicators of total intangible asset value size. Gordon Petrash, a former director of the intangible asset management system proposed the following five steps:

1. Defining the role of knowledge in a company;
2. Analyzing competitors' strategy and intangible resources;
3. Classifying intangible resources of a company;
4. Estimating the value of intangible resources that are prepared for further storage, development, sales or abandonment;
5. Forming new knowledge portfolio and repeating the whole process.

3.1.2 Value Explorer

The knowledge advisory services department of KPMG Netherlands (Andriesson, 2005) developed an IC measurement tool called the value explorer method. It is an accounting methodology for calculating and allocating value to five types of intangibles:

1) Assets and endowments,
2) Skills and tacit knowledge,
3) Collective values and norms,
4) Technology and explicit knowledge,
5) Primary and management processes.

This method was based on the following five steps:

1) Identifying company's intangible assets on key competencies;
2) Estimating value by analyzing characteristics of key competencies through added value, competition,potential, sustainability and robustness;
3) Financial estimation of intangible assets by allocation of expected future benefits;
4) Developing managerial plan based on the previous phase by providing the management with suggestions which relate to the best way of adding intangible asset value;
5) Management reporting the value dashboard together.

3.1.3 Intellectual Asset Valuation

The main idea of Intellectual Asset Valuation (Sullivan 2000) is to measure the value of a company's intangible assets based on the value of the discounted future cash flows generated. And this calculation is based on the principle of "going concern".

According to Sullivan (2000), the total market value of a company is the sum of its tangible assets (i.e. Total book value) and the potential value of these assets (i.e. Discounted cash flow).

From an intellectual capital perspective, the same relationship can be expressed as that the total market value is the sum of the structural capital and the intellectual capital (Sullivan 2000), which mean that the value of a company's intellectual capital equals the value of discounted cash flows that the company will generate.

3.1.4 TOTAL VALUE CREATION

The total value creation method was established by the Canadian Institute of Chartered Accountants (CICA),Anderson and mclean. This method is based on discounting cash inflows from events, not from business transactions. This was a huge change because most calculations had considered business transactions as a discounted value. This method has four major elements (Andersen and mclean, 2000):

- Strategy for developing and realizing a company's value;
- Discounting cash flows based on future value events;
- Report about a company's capacity to generate future values;
- Report focused on the owners of capital that is presented in financial and non-financial measurements.

3.2 Market Capitalization Methods (Mcm)

According to Luthy (1998) and Williams (2000). These approaches are supported by the financial information of a firm and aim to calculate the value of intellectual capital by the difference between the company's and its market capitalization. A common characteristic of the MC methods is that they all use capital market values to assess the overall value of the IC.

These methods are not easily applicable in non-profit organizations or public sector enterprises (e.g. The ratio of market value to book value, Tobin's q, market value ascribed by the investor, etc.)

3.2.1 Tobin's Q Ratio

Tobin's Q ratio was developed by James Tobin, it equals to "the market value" of a company divided by its "assets replacement costs". (Tobin and Brainard (1968); Tobin and Brainard (1977); Tobin (1969); and Tobin (1978)).

The formula of Tobin's Q ratio is:

Q ratio = Total Market Value / Total Asset value

This ratio is used in order to analyze intangible assets, which reveals that if a coefficient q increases, it shows that a company is investing more and more in technology or human capital. This ratio allows us to compare between total market value of a company and its cost of replacement. Therefore, if the q is greater than 1 this means that investors will invest in the company with a value greater than its cost of replacement, which is a good sign, and it is not if the coefficient if it is smaller than 1.

This ratio proves how intangible assets are important nowadays to create a competitive advantage for companies taking into consideration that it is not hard for the companies to obtain machines, tools or techniques.

Therefore, a company differ from another one by its intangible assets. Moreover, this ratio is very useful for benchmarking for the companies on the same industry.

3.2.2 Market To Book Value

According to Stewart (1997), the market to book value is defined as a financial evaluation metrics that aims to compare a company's total market value with the total book value. The book-to-market ratio is the indicator that compares a company's book value to its market value. A firm's book value can be calculated by looking at the company's historical cost, or its accounting value.

We can determine the market value of a firm based on its share price in the stock exchange market and the amount of shares this company has outstanding, which is its market capitalization.

To calculate the market to book value:

MV/BV = Market Value/Book Value

- If the result of this ratio is higher than 1, we deduct that the firm has some extra values that are not recorded in the financial statements, which are the intangible assets.
- Otherwise, if the result is lower than 1, it shows that the intellectual assets have a negative influence on the company.
- However, given that several external factors can impact e a company's market value, the rate may notalways be an accurate measure of intellectual property.

The MV/BV ratio is certainly helpful for companies quoted on the stock market.

3.2.3 Investor Assigned Market Value

The investor Assigned Market Value method was developed by (Stanfield, in1998). This method considers the Total Market value of a company to be equal to its Market capitalization value and divides it into this formula:

Total market value = Tangible assets + Realized Intangible assets + Erosion of Intangible assets +Sustainable Competitive Advantage (SCA)

Where:

- Tangible assets: is the total book value;
- Realized intangible assets: patents, licenses, franchises and similar;
- Erosion of Intangible asset: the lost value of these assets;
- SCA: the core of competitiveness of a company.

Beside tangible assets, the other elements are hard to valuate which makes the calculation problematic.

3.3 Return On Assets (Roa)

Return on assets or ROA is a form of calculating return on investments, it indicates how much net income or profit the company is generating relative to its invested assets. The higher the number, the greater the return the company is generating.

The formula of ROA is :

ROA = Net Income / Average Assets or Net Income / End of period assets

Where:

Net income = net earnings or net income in the year (annual period)Average assets= (ending assets-beginning assets)/2

3.3.1 Economic Value Added (Eva)

According to Stern Stewart (1993), the Economic Value Added (EVA) method is calculated by the differencebetween a firm's net operating income after taxes and its cost of capital. The usefulness of this method, especiallyin intellectual capital valuation, relies on the fact that it shows to what extent the total net income capable cover the costs of capital.

According to Stern Stewart, he formula for calculating EVA is as follows:

EVA = NOPAC – (WACC x IC)

Where:

NOPAC= Net Operating Profit After Tax WACC= Weighted Average Cost of Capital IC= Invested Capital

The main purpose of EVA method is to determine how much value a company creates from the capital invested. Also, this method has provided great flexibility in the financial analysis's procedures (Girotra and Yaddav, 2001).

3.3.2 Market Value Added (Mva)

The MVA, or the Market Value Added, is a performance measurement tool that shows the way the marketvalues the performance of a company; by calculating the difference between the total market value of a company and the economic capital from the point of view of the investors, therefore, maximizing this value must be a priority goal for every company interested in its shareholders.

The formula in computing for the market value added is:

MVA = MV - Book value of equity

3.4 Scorecard Methods

Scorecard methods are methods based on the identification of financial and non-financial indicators. These methods take into consideration different elements of intangible assets or intellectual capital in their report as a graph. There are many similarities with the direct intellectual capital methods, and their only difference is in the inability to produce results in monetary values. These methods just present values and indicators as they are. This is one of the biggest disadvantages of this method.

3.4.1 The Balanced Score Card

A company's performance is measured by indicators covering four major focus perspectives: (1) financial perspective; (2) customer perspective; (3) internal process perspective; and (4) learning perspective. The indicators are based on the strategic objectives of the firm. (Robert Kaplan and David Norton) (1992).

The Balanced Scorecard enables every firm to select its own indicators to be used from a specific perspective. It is an essential measurement instrument for viewing an organization's strategy, systems and processes. (Jurczak, 2008).

How does the balanced scorecard work?

The scorecard puts in place four perspectives to measure your company's health:

- The financial perspective: Are you doing well by your shareholders?
- The costumer perspective: Do they like your products and services?
- The internal perspective: Can you efficiently deliver what your costumer wants?
- The learning and growth perspective: How to continue to improve and create value?

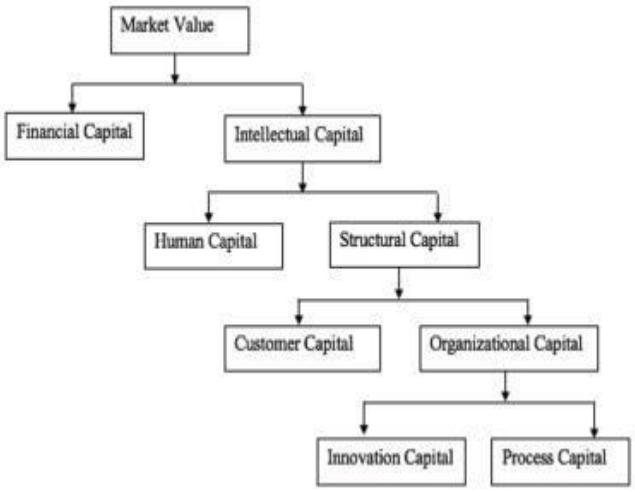
3.4.2 IC INDEX

The IC-Index addresses a "second generation" practice which centers around giving a general image of the value-creation processes of the organization, while "first generation" works on giving data on single parts ofintellectual capital (Roos et al.,1997)

IC-Index' main purpose to consolidate the multiple individual indicators into one single index, and to correlate the changes in the market with the changes in intellectual capital.

The advantage of this index

- It provides an improvement over having long lists of individual indicators requiring companies to understand the priorities and relationships that exist between their different measures
- The IC-index is a step forward because it gives managers a clearer vision of the effects a certain strategy has on the IC of a company and compare two alternatives to find out which one is preferable from an IC point of view".
- The IC-index enables a systematic benchmarking of future-oriented actions providing comparisonsat both business unit and corporate levels. We can do this at an industry level as well, where new standards may rise for analysing differences between companies.



3.4.3 Skandia Navigator

Skandia Navigator is the first model of measuring IC that was developed by Edvinsson (1997), which refers to the total market value of a company is as a sum of financial and intellectual capital.

The Skandia model offers 111 indicators to measure 5 components, which are as follow: financial, human, customer, innovation, and process, however, the developers of this model suggest the uses of a different set of attributes if necessary. (Edvinsson and Mallone, 1997).

Figure: Skandia Navigator [Edvinsson,1997]

3.4.4 INTANGIBLE ASSET MONITOR (IAM)

Intangible Assets monitor (Sveiby, 1997) is non-financial measurement based on the concept of knowledge organization. The purpose of (IAM) is to evaluate intangible assets in simple manner and to present several relevant indicators for measuring IC.

According to Sveiby (1997), the Intangible Assets Monitor is composed of three main intangible assets: competence of personnel, internal structure assets and external structure assets. All those three intangible assets are compared with the same indicators that indicate change and knowledge flows: growth or renewal, efficiency, and stability (Sveiby, 1997). The choice of indicators depends on every company.

1 CONCLUSION

Although the knowledge is more and more important as a factor of production, most accounting systems arestill based on the traditional factors of production.

Regulators and authorities are struggling with this "intangible" nature of most companies' activities and the source of their value to the point where new rules must be developed.

This indicates that at least publicly traded companies have an optional tool to measure and manage their intangible assets, as financial intangible assets, because financial reporting in the future may be lacking of such measures.

Intellectual capital can be assessed in a variety of ways. However, there is no consistent and widely accepted method of measurement, as Sveiby said, “No one method can fulfill all purposes; one must select methods depending on purpose, situation and audience. (Sveiby, 2003).

REFERENCES

Edvinsson, Leif, and Michael S. Malone. Intellectual capital. Harperbusiness,, 1997. Brooking, Annie. "Model Technology Broker." Annie obtenido el 18 (1996).

Andriesson, Daniel. "Implementing the KPMG Value Explorer: Critical success factors for applying IC measurement tools." Journal of Intellectual Capital (2005).

Patrick H. Sullivan Jr Patrick H. Sullivan Sr, (2000),"Valuing intangibles companies – An intellectual capital approach", Journal of Intellectual Capital, Vol. 1 Iss 4 pp. 328 - 340

Chen, Shimin, and James L. Dodd. “Economic Value Added (EVATM): An Empirical Examination Of A New Corporate Performance Measure.” Journal of Managerial Issues, vol. 9, no. 3, Pittsburg State University, 1997, pp. 318–33,

Sharma, Anil K., and Satish Kumar. "Economic value added (EVA)-literature review and relevant issues." International journal of economics and finance 2.2 (2010): 200-220

Sveiby, K. E. (1997). The Intangible Assets Monitor. Journal of Human Resource Costing & Accounting, 2(1), 73-97.

Petkovic, Milos. Relationship between Investments in Intellectual Capital and Company's Book Value: evidence from French Companies (2008-2016). Diss. Université Côte d'Azur (comue), 2019.

Chen, M. C., Cheng, S. J., & Hwang, Y. (2005). An empirical investigation of the relationship between intellectual capital and firms’ market value and financial performance. Journal of intellectual capital.