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MEASUREMENT OF INTELLECTUAL CAPITAL AS EXEMPLIFIED BY METHODS OF GROUPS BASED ON THE ROA INDICATOR AND ON MARKET CAPITALIZATION

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Abstract

The concept of a knowledge-based economy is a relatively new topic, but it does not mean that the previous economies did not use knowledge. For many years, knowledge formed the basis of any economy, it was a factor that set the pace of each of them, but just nit is making a significant impact on the entrepreneurial environment, and more. Inherent KBE is the concept of intellectual capital. The article raises both theoretical approaches towards the concept of intellectual capital, and points to the importance (from the point of view of managing this intangible value in the company) –of measuring intellectual capital. The process of good management of the value of intangible assets must be supported by knowledge about, e. g.,its size, value, etc.

The authors focus on presenting methods of measuring intellectual capital from two groups of methods by the classification made by K. E. Sveiby, who is considered one of the fathers of the IC concept. The goal of the article is to compare methods from these two groups in terms of their flaws and advantages as regards preparing business analysis. This is done through presentation of the topic, including the concept and methods of intellectual capital measurement, which was based on the review of the literature.Furthermore, based on financial statements of companies from the WIG- oil&gas index and WIG- food industry indexwaysof interpreting the final results are presented.

JEL classification: D24, E22, M49, O34
Keywords: intellectual capital, IC, knowledge based economy, measurement of IC, MV/BV,CIV, oil&gas industry, food industry, WIG - index

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Introduction

In recent years, one can notice a shift from traditional to more knowledge-based economies. While the first expected diligent bookkeeping based on the analysis of capital owned, in the case of an informational society, which bases its development on knowledge, it is necessary to have a systematic way of identifying, measuring and introducing to company reports data, concerning both the topic of tangible and more importantly intangible assets, which currently are the motor of socio-economic development. It is precisely this last factor, knowledge, which poses a significant problem because of the lack of proper methods and tools for measuring intellectual capital. This paper's aim is an attempt to define intellectual value and to show certain chosen methods for measuring intellectual capital.

The main goal of this paper, which was written using literature on the subject, is to present and compare certain chosen methods of measuring the intellectual capital of an enterprise and to point out the flaws and advantages which the proposed models contain.

For more clarity, presented are the ways of measuring IC (using two of the easiest and most popular methods) and the flaws and advantages of those models exemplified by companiesincluded in the WIG- oil&gas index and the WIG- food industry index.

The concept of intellectual capital

The genesis of the concept of intellectual capital dates back to the 1980s. One of the sources states that the concept of intellectual capital first appeared in 1958 in the comments of financial analysists regarding small, information enterprises (Sopińska, 2010, p. 95). They were the result of observing the connections between high ratings of a company and the assets it owned; it was then concluded that it is intellectual capital, which is the most important component of a firm (Sopińska, 2010, p. 95).

The history of the concept of "intellectual capital", as well as of the whole academic discipline of knowledge-based economies, has been gaining recognition only since 1987, when a conference dedicated to the topic of "knowledge asset management" was organized in the United States (Hofman, 2011, p. 81). In addition to that, at the same time in Sweden, from the initiative of K. E. Sveiby, the "Konrad Group" was formed, which began work on identifying and measuring intellectual capital (Hofman, 2011, p. 81). The first significant success of the aforementioned group is the 1989 publication of a report in which the current financial indicators and their validity for judging the firm's condition are highlighted. In the published document, the Konrad Group decided to propose taking into consideration intangible assets, which form the know-how of the enterprise. Precursors in introducing new solutions connected with measuring intellectual capital were two Swedish firms: the first, WM Data, attached to its annual report (in 1989) the world's first appendix dedicated to the intellectual capital of its organization (Sopińska & Wachowaik, 2004). Two years later (in 1991), a pioneer insurance firm, Skandia AFS, included in its organizational structures the position of Director of Intellectual Capital, which was held by L. Edvinsson. The sector for which he was responsible was to individualize and develop the intellectual capital of the enterprise so as to complete the value stated in the financial reports (Szałkowski, 2005, p. 36).

A real interest in the topic of intellectual capital was initiated by W. Wriston and H. Itami. It was these two, who, at the beginning of the 1980s (just as the aforementioned J. K. Galbraith & K.E. Sveiby), started developing the concept of intellectual capital (Sopińska, 2010, p. 96). W. Wriston, the president of the then biggest bank in the United States, noticed that enterprises (including banks), have unmeasured intellectual capital at their disposal, which forms their value. However, H. Itami, while conducting his own research on financial results of Japanese firms, noticed the difference between market value and book value of an enterprise. In the documents that he prepared, he stated that the visible differences were caused by a conscious use of intangible assets owned by some of the researched subjects (Sopińska, 2010, p. 96). As a result of his research, numerous conferences and reports were organized; what followed was an attempt to redefine the concept of intellectual capital as well as the schemes in the bookkeeping practice of that period. All of this was done in order to define in a most precise way the value of that component of enterprise capital.

In order to place in time the creation of an existing distribution of assets, in this paper, a chronological order proposed by M. Mroziewski has been used. According to it, defining concepts tied to intellectual assets originated

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in the division done by E. Panrose (in 1959), who separated enterprise resources into material and human (Mroziewski, 2008, p. 26). P. Drucker contributed to further development of the discussion on the subject by stressing that an enterprise is an organization that is concentrated around knowledge (hidden in the form of specialists); by doing this, he focuses the attention on the significant role of knowledge in an organization (Mroziewski, 2008, p. 27). Furthermore, during the 1970s and 1980s, the discipline's development was influenced by the already mentioned K. Galbraith and H. Itami. J.K. Galbraith relates the concept of intellectual capital to the person (Szałkowski, 2005, p. 33), while H. Itami notices a source of additional capital for the enterprise in the form of intangible resources such as technology, the trust of the clients, and managerial skills. It is worth underlining that it is precisely these two completely different perspectives that point to diverging interpretations of the same concept, and they explain why, to this day, it has been impossible to come up with one, complete definition of intellectual capital.

The end of the 1980s is characterized by the growing importance of intangible assets of an enterprise in the opinions of economic specialists. An opinion appears which points to a lesser significance of measures "based on financial resources" (Mroziewski, 2008, p. 26), which leads to looking at the fact that skills and knowledge, which an enterprise is concentrated around, are the essence of competition. It is those factors among others that we call today intellectual capital.

As can be easily seen, all of the aforementioned views focus on a single thesis: that knowledge is the driving factor for enterprises and their development, and in consequence, also for economic growth. Unfortunately, the aim of this observation is not to define the described term. The concept "intellectual capital" was first introduced by T. Stewart only in 1991. In his article, he shows that intellectual capital influences the actions of every enterprise, which in turn depend on the patents, technology, and managerial skills as well as the experience and information about consumers (clients) and suppliers that it possesses (Szałkowski, 2005, p. 36). Intellectual capital, according to T. Stewart, is the factors that influence organization and that can be "used to create wealth" (Jarugowa & Fijałkowska, 2002, p. 58). It can be therefore deduced that knowledge, which an enterprise possesses and which constantly influences its outcomes, and therefore organizational profitability, is exactly the intellectual capital of the firm. T. Stewart picks out the following three categories of intellectual capital (Mroziewski, 2008, p. 27):

1) human capital,
2) customer capital,
3) structural capital.

According to T. Stewart, human capital is understood as the potential within the workers of the firm, while its essence is introducing innovation to the organization and creating new products. The measurement of customer capital is among other things the consumers' involvement in the market. It is the value of the relationship between the firm and the client. The last component of intellectual capital is structural capital, which T. Stewart understood as knowledge which can be transformed, shared and renewed (Sopińska, 2010, p. 109). In 1993, W. J. Hudson defines intellectual capital in relation to a person. He states that it can be understood not only as a personal resource, which is a combination of experiences, obtained knowledge or attitudes, but also as determined genetically (Mroziewski, 2008, p. 27). This view is closer to understanding the discussed concept in relation to the person.

In 1992, not even a year after Skandia's creation of the intellectual capital sector, the conclusion which confirmed the unfinanced character of intellectual capital was formulated. According to L. Edvinsson's team, intellectual capital is the gap between book value and market value. As the work of the team continued, a market value structure of an enterprise was formed, composed of financial capital and intellectual organization. According to research conducted by one of the Swedish insurance units, there exist two forms of intellectual capital (Edvinsson & Malone, 2001, p. 17):

1) human capital,
2) structural capital.

Included in the components of human capital are knowledge, skills of the workers, their ability to carry out the tasks in an efficient way, and factors pertaining to organization such as the culture of organization, the philosophy and mission of the firm. Structural capital is made up of consumer capital (the relationships with clients) as well as organization capital (this includes the capital connected to innovations and capital resulting from processes). Structural capital includes for example the computers owned and the software, etc. It is also the patents and trademarks, which means "everything

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that remains in the office once the workers go home" (Edvinsson & Malone, 2001, pp. 17-18). Structural capital, unlike human capital, can be sold because it is the property of the enterprise.

In the same period as L. Edvinsson, intellectual capital was defined by K. E. Sveiby, who conceptually linked his definition of intellectual capital with knowledge management. He believed that knowledge management is a process of creating enterprise value from assets of the intangible form (Jarugowa & Fijałkowska, 2002 p. 59). According to Sveiby, just as structural capital, intellectual capital is composed of domestic capital in which we have the name of the enterprise, the brand, clients and their loyalty, franchise agreements or distribution channels as well as the workers' competences; components overlapping with human capital include the know-how, workers' education, the competences connected to their jobs, and even an entrepreneurial atmosphere. The portrayed model became simpler with time; nevertheless, it stands by the same categories: human and structural (interior and exterior) capital (Sopińska, 2010, p. 111).

In this place, it is worth mentioning the very popular division of intellectual capital according to the definition given by the European Commission in 2001, which split the key concepts into three categories (Mroziewski, 2008, p. 28):

1) human capital,
2) structural capital,
3) relational capital.

Human capital is the knowledge and experience of workers, their skills and competences, which to a large degree are individual for each worker. Structural capital is composed of procedures, systems, data bases, or organization culture. The last category is made up of relations with domains outside the enterprise such as: clients, suppliers, as well as partners in the sphere of research and growth (B+R) and investors (Mroziewski, 2008, p. 28).

Intellectual capital (as the presented definitions depict) is most commonly understood in the organizational dimension of given units. The last definition that was mentioned points out that it is not only the researchers that are interested in the term, but also organizations such as the European Commission or OECD. The first that established the practice of reporting investments in intangible assets was the Organization for Economic Cooperation and Development (OECD), according to which these investments encompass "all long-term investments done by firms whose aim is to increase future outputs as an outcome of actions other than buying fixed assets" (Barburski, 2005, p. 115-116). The OECD defines intellectual capital as "the economic value of two intangible assets categories of an enterprise: organizational (structural) and human" (Urbanek, 2008, p. 32).

It is worth mentioning the bookkeeping approach to intellectual capital, which was stated at the beginning of this paper. The Canadian Accountants Association calls intellectual capital things based on knowledge, which are the source of profit for an enterprise and which are owned by it (Szałkowska, 2005, p. 41). The broad range of understanding the analyzed term also excludes the possibility of comparing intellectual capital to "intangible assets" present in bookkeeping. This is caused by international standards limiting intangible assets to a very narrow concept. The definitions contained in bookkeeping standards state that aside from the fact that intangible assets cannot be of a physical form, they must also be indefinable and unfinanced. In these standards, the necessity to control these assets is also stressed (Jarugowa & Fijałkowska, 2002, p. 61). To these assets belong patents and copyrights, while human resources, here especially the loyalty of the clients and the workers' experience, are not; but it is precisely these elements (which are included in the other definitions that were mentioned above) that have a particular impact on the value of the firm. Unfortunately, to this day, coherent bookkeeping standards, which would correctly incorporate intellectual capital (as part of the firm's capital), have not been formulated (Jarugowa & Fijałkowska, 2002, p. 64).

The aforementioned explanations show just how complex this topic is, how difficult it is to define it and just how much it can vary depending on the person defining it and the perspective in which it is viewed. Research results show a variety of components of intellectual capital, and this explains the existence of different definitions as well as the fact already mentioned: the lack of a coherent concept (Janošević, 2013, p. 2). Most of the presented characteristics originated by intuition; therefore, a single, coherent definition of the concept is nonexistent. Formulating a single coherent definition of intellectual capital for the purposes of this paper, we can say that it is capital "…created on the base of knowledge and developed by engaging the employees of a given

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enterprise"(Palimąka & Gumieniak, 2014, p. 207).

Taking into account the above review of literature and the attempts to define intellectual capital, the following characteristics which connect all of the aforementioned definitions, can be presented. According to these, intellectual capital is (Sopińska, 2010, p. 104):

1) is knowledge-based,
2) is the difference between market value and book value,
3) due to long-term consequences cannot be used in traditional bookkeeping,
4) conditions competitive advantage of enterprises,
5) guarantees the increase in value of a firm,
6) can be divided into different categories (i.e. structural and human capital, etc.),
7) is composed of intellectual property and knowledge capital.

MV/BV METHODFROM A GROUP OF METHODS BASED ON MARKET CAPITALIZATION

Methods based on market capitalization, because of their use, make it possible to determine if in a given enterprise there exists a difference between book and market value. Thanks to this information, we obtain the value of the so called "intellectual capital of a firm", which is precisely this difference (Dobija, 2003, p. 105). Market value is the real value of the enterprise and comparing it to the book value provides the information as to whether the firm was overrated or maybe underrated by the market.

MV/BV Method

The easiest method of measuring intellectual capital which completely fulfills the characteristics of a group of methods based on market capitalization, is an indicator based on the relation of market value to book value. This method rests on the claim that the value of intellectual capital is the difference between market and book value of an enterprise (Jarugowa & Fijałkowska, 2002, p. 128). The second way of measuring is comparing these two values to one another, which helps to distinguish what part of the real enterprise value is the book value. It is this second way that shows the methodology of the MV/BV indicator. This model belongs to indicator methods, and it was proposed by T. Stewart in 1997 (Sopińska, 2010, p. 130).

When using the indicator, comparing market value to the book value does not provide the value of intellectual capital; the indicator only brings attention to the answer if an enterprise has intellectual capital (Hofman, 2011, p. 85). All of this being based on the premise that market value is the sum of book value and the value of intellectual capital (Nita, 2013, p. 643).

When an enterprise is a company listed on the stock exchange, its market value is the product of its share's market price and number of shares. In the case of a firm that is not listed on the stock exchange, its market value is determined using a comparative method: the value of the shares is determined by the information obtained about the value of the companies which are listed on the exchange (Nita, 2013, p. 643). Aside from the market value, it is necessary to provide the book value of an enterprise. The most common method to obtain the book value which can be used along with this method, is the valuation of book value of net assets; this means decreasing the general book value of assets by the book value of outside capital. The next step is estimating the value of outside capital, which can be understood in two ways. On the one hand, it is defined as the sum of long and short-term commitments and special funds; on the other hand, we can add to it also reserves and accruals (Kasiewicz & Rogowski, 2006, p. 199). The second case brings the necessary value down to book value of a given enterprise's equity.

Analogically to the above explanations, the MV/BV model looks like this:

$$\frac{MV}{BV} = \frac{share\ price \times number\ of\ shares}{asset - outside\ capital} \quad (1)$$

By interpreting the discussed indicator, one can understand the relation of market value to book value as a capacity (or the lack thereof) of the enterprise to create the value of intellectual capital. A value greater than one informs us that intellectual capital is present in an enterprise (Hofman, 2011, p. 85). It also exemplifies a situation in which the firm bases its activity on intellectual capital (Urbanek, 2008, p. 106). A result greater than the value of 1 gives the information that inside the enterprise there exists a part of intellectual capital which was not included in bookkeeping balance sheets, but which contributed to the growth of the real value of the firm (Kasiewicz, 2006, p. 200).

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Thanks to its comprehensibility, this method can serve in comparing an enterprise with its competition, with other companies of the same branch, or even to monitor changes occurring in the intellectual capital of an enterprise (Kasiewicz et al., 2006, p. 200). This method is considered to be clear and easy to use due to readily accessible information which is needed for the calculations. Nevertheless, this is a plus only in the case of companies listed on the exchanges (Urbanek, 2008, p. 106). Even though the calculations are simple, they are not without objection. The simpler the measuring instrument of the calculation, the less precise the information that it provides (Jarugowa & Fijałkowska, 2002, p. 128).

The MV/BV indicator is criticized also for the premises on which it is based, namely, the claim that intellectual capital is the difference between market and book value (Nita, 2013, p. 645). In literature, there are examples which argue against this methodology. Researchers agree that intellectual capital is something more than the amount of market value which is above the book value; if this was not the case, the value of intellectual capital would be provided by the bookkeeping policies in practice or by the accepted standards of bookkeeping (Kasiewicz et al., 2006, p. 200). The other criticism is that exterior factors which influence market value of an enterprise are ignored, and which include phenomena like: accidents, seasonal occurrences, the market's atmosphere of anxiety, which is caused by information that can influence the way investors look at a certain company (Jarugowa & Fijałkowska, 2002, p. 129). None of these situations can be controlled by managers, which in turn goes against the claim about the control of the managerial cadre and therefore, also the control of intellectual capital. The last criticism of the MV/BV method is the comparison of two values differing from each other-market and book value. Each of these values is based on completely different data. In the case of book value, we calculate it as a result of using historical data; this is in contrast with market value, which is usually the result of foreseeing either company situations or more often, the plans for upcoming years (Palimąka & Gumieniak, 2014, p. 211).

To sum up, the model proposed by T. Stewart shows a divergence in market and book values; nonetheless the relationship between these values points to the existence of intellectual capital in an enterprise. The indicator is usually used in order to have a general idea of the existence of intellectual capital even if this is so only thanks to the simple interpretation of results and easy access to data. Numerous criticisms of the method, and its beginning premises that are not completely true, exist (Kasiewicz et al., 2006, p. 217).

CIV method from a group of methods based on the ROA indicator

The methods based on the ROA indicator involve putting an equal sign between average profits before taxation and the average value of tangible assets of an enterprise. This then is put side by side with the average indicator of asset leasing in a sector in which the firm functions. The difference obtained is multiplied by the average value of tangible assets in order to receive the value of the so called "average annual profits from tangible assets". In the last step, the obtained value is divided by the average cost of the capital or the interest rate, which provides the results; they will be the value of intangible assets or equal to them intellectual capital. The methods from this group are based on the premise that the existence of intellectual capital in an enterprise impacts its profits or losses, even if it is not included in the financial reports of the firm (Pilková et al., 2013, p. 330).

CIV method

In the CIV method (Calculated Intangible Value), one steps away from market value analysis and begins to take into consideration return on assets (ROA). It is one of the first methods known for calculating intangible values of an enterprise (Dobija, 2003, p. 107). The model of the estimated intangible value claims that the value of intellectual capital of an enterprise is the same as its ability to "outrun" the average competitor, who possesses similar tangible assets and belongs to the same sector (Fijałkowska, 2012, p. 421). The original purpose of the discussed method was its use for taxation aims such as "to determine the market value of intangible assets of a firm" (Kasiewicz et al., 2006, p. 204). The model was developed by NCI Research already in the 1930s during the introduction of prohibition in the United States (calculating the value lost because of it in intangible assets) (Sopińska, 2010, p. 133). The developed model was to be helpful for firm, which are willing to have outside financing (credit, loan) and which base their activity especially on knowledge. Other sources, when citing initiators of this methodology, list the American Internal Revenue Services (IRS), whose

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decree 68-609 (after certain corrections) functions to this day (Dobija, 2003, p. 107).

To valuate intellectual capital, in 1995, T. A. Stewart modified the CIV method so that in seven steps it would be possible to state a close estimate of the value of intellectual capital of an enterprise. One of the fundamental amounts in the model which conditioned the end value, was the ROA amount for the company and the sector to which the enterprise belongs. If ROA for the company is higher than ROA for the sector, this means that the intellectual capital is present in the enterprise (Kasiewicz et al., 2006, p. 204). The contrary result means a lower use of intellectual capital in relation to competition.

The received result gives the value of owned intangible values (to which intellectual capital can be equated) and allows managers to compare the enterprise to its competition and provides additional information such as if the investments in intangible assets are profitable for the firm (Dobija, 2003, p. 108).

The CIV model methodology is based on seven steps according to which other calculations are performed, while the end result is the so called intellectual premium. At the very beginning, it is necessary to calculate the average profit before taxation from the last three (or five) years of the firm's activity (Nita, 2007, p. 110). Next, based on the balance sheets of the firm, the average value of tangible assets is determined, which is for the same time period as the average gross profit (Sopińska, 2010, p. 133). The third step is calculating the average ROA value for the given period, which we receive by using the product of the two earlier values, namely the relation of the average gross profit to the average value of assets (Kasiewicz et al., 2006, p. 204). The following step determines the average value of ROA for the sector to which the enterprise belongs (also for a time period of three or five years) (Nita, 2007, p. 646). In the fifth step, one has to calculate the so called excess return. This is done by multiplying the results of the third and fourth step (the average ROA indicator and the average value of tangible assets), as well as decreasing the average profit before taxation by the earlier received value (Kasiewicz et al., 2006, p. 204). The next step calculates the so called intellectual premium, which is the profit on intangible assets. For this reason, the average rate of taxation of the researched time period is calculated, which later can be multiplied by the answer from the fifth step, which is excess return(Sopińska, 2010, p. 134). The amount of the premium is the difference between the amount of the excess return and the value received in this step. The last step is bringing back today's value of the premium calculated above by dividing it by the right bank rate. The cost of the capital of a given enterprise can become the bank rate (Nita, 2007, p. 646).

The "intellectual premium" received in this last step shows the average profit gained by an enterprise- in relation to the competition in the sector- thanks to it possessing intellectual capital (Nita, 2007, p. 646). It informs us how much a company could gain if it owned intellectual capital (in relation to firms from the sector) (Kasiewicz et al., 2006, p. 205). If the value of the indicator grows, it attests to a constantly bigger capacity of the firm to generate future intangible profits; if the value decreases, it informs us about the ineffective use of intellectual capital by investing in tangible assets (Urbanek, 2008, p. 109).

The data required for the above calculation comes from financial statements of the company for the last three or five years, as well as from the capital market's data (value of the average rate of asset return for a sector) (Sopińska, 2010, p. 134). It is precisely this availability of data that is a beneficial characteristic of the CIV model. It can serve to compare competitive enterprises. It is an efficient tool of benchmarking; it is also necessary to remember, with each comparison, about the so called investment cycles of an enterprise, which vary among companies. These differences will influence the resulting value, which may not always mean that the possessed intellectual capital is used in a worse manner because it can simply be a signal that the company began an advantageous investment (Urbanek, 2008, p. 109).

A significant problem when measuring the value of intangible assets is that the money spent on intangible assets is carried over as a cost of the enterprise, which decreases its profits. This approach contradicts the premise that claims an increase in profits for a company that uses intangible assets (Urbanek, 2008, p. 109). Moreover, the literature brings attention to two of the biggest weaknesses of the described method. The first is averaging the values, which, due to the fact that they are imprecise, disturb the overall picture of the capital. The second weakness is basing the present value on the "intellectual premium", which is discontinued by the cost of the capital of the firm. Because of this, it is necessary to use the cost of capital in the given branch in order to

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eliminate the obtained difference; with this, the values will inevitably be averaged (Jarugowa & Fijałkowska, 2002, p. 131).

Summing up, the CIV method is often considered to be "one of the [methods] that best reflects the intellectual capital of an enterprise" (Fijałkowska, 2012, p. 423). The end value, due to constant averaging, is not as precise as the values of specific components on the balance sheet; nevertheless, in a simple way, the method depicts the value of a company's intellectual capital (Sopińska, 2010, p. 134). It requires a seven-step calculation, the result of which provides the so called "intellectual premium"; this is on par with intangible assets or intellectual capital (Wierżyński, 2010). And what is also crucial, the CIV model is based on easily accessible data (which does not require "entering" the enterprise).

Measurement of intellectual capital as exemplified by companies includedin the WIG-oil&gas index and in the WIG-food industry index

There are many models of measurement of intellectual capital described in literature. Scientists still try to improve all common methods or to create new ones (taking into account their opinion the most important factors of intellectual capital of company). In this study,two methods existing in the literaturediscussed above were selected for study, and in order to demonstrate how to interpret them, the results for 6 companies in the oil industry, included in the WIG- oil&gas index and WIG-food industry index[1] were calculated.

The selected companies are listed on the Warsaw Stock Exchange and belong to the oil industry. For measuring the intellectual capital of selected companies were used financial data for the period 2012- 2015 (in the case of CIV model also 2009, 2010 and 2011) derived from the financial statements of these companies, available on the company's websites. In tables there are presented the final value of IC of each of these companies in the period 2012 – 2015 (determined by access to the financial data for all selected companies). The main goal of measurement in this paper is to judge the correctness of the way of interpretation of results proposed in literature and the amounts of intellectual capital measured by these models. However, it is necessary to say that the final results are only the estimated value - the actual value may differ from that indicated below.

MV/BV Method

This part presents calculation based on the MV/BV method of intellectual capital measurement The results will be interpreted to get answers to two basic questions. First of all, it should be show if this method gives a real picture of intellectual capital in the chosen companies; and secondly, whether the theoretic way of interpretation of this data is helpful in practice.

There are two ways to interpret the MV/BV indicator. The first shows that three of the companies (because their indicators are lower than 1) do not have any intellectual

1 Based on: https://www.gpw.pl/indeksy_gieldowe_en?isin=PL9999999722&ph_tresc_glowna_start=show#portfolio, access at 16.08.2016.

Table 1: IC value of companies from WIG- oil&gas index in the period 2012-2015 exemplified by MV/BV method

Company	2012	2013	2014	2015
EXILLON ENERGY PLC	0,68	0,78	1,1	0,75
GRUPA LOTOS S.A.	0,38	0,49	0,68	0,68
MOL MAGYAR OLAJ - ES GAZIPARI NYILVANOSAN MUKO-DO RESZVENYTARSASAG	1,08	1	0,75	0,96
POLSKIE GÓRNICTWO NAFTOWE I GAZOWNICTWO S.A. (PGNiG S.A.)	-1,61	-3,81	-3,8	-5,63
POLSKI KONCERN NAFTOWY ORLEN S.A. (PKN Orlen S.A.)	0,6	0,73	0,89	1,17
SERINUS ENERGY INC.	2,23	1,13	1,74	0,95

Source: Own elaboration based on financial statements of each company

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capital. But on the other hand, it is not possible to have no intellectual capital, when there are existing some company basic values like: human capital or structural capital. According to that, we suppose that the companies are not concentrating their market advantages on creating intellectual capital. The second way to interpret those statistic inform us that there should be some non-included (in company reports) intellectual capital, which has an important influence on creating real company value. Moreover, our results show that those companies are undervalued on the stock market (their market values are lower than book value). To take a better view of those results we should point out that there was only one company in an upward trend: PGNiG S.A. Its score shows that there was a possible situation to improve position on the market based on intellectual capital.

The case with a negative rate of MV/BV in PGNiG S.A. could be interpreted in many ways. First of all, investors could take a bigger value of foreign capital than equity capital as a sign of the ability of the company to raise more money, which makes its intellectual value. On the other hand, this situation could point out that the company is operating more on somebody else's knowledge rather than on their own know-how and because of that the MV/BV rate shows negative values.

Similarly to the previous examples, results of food sector companiesshow as that there are some companies which could improve their level of intellectual capital utilization: KSG Agro S.A., Colian Holding S.A.and Kernel Holding S.A. On the other hand there are two companies whose results are worth imitation: Zakłady Tłuszczowe Kruszwica S.A. and Wawel S.A. The latter has an incredibly high IC value (above 3,7) exemplified for 2015 by the MV/BV method.

The examples confirm the doubts about the rightness of the use of the method of MV/BV. Questionable seems to be the use of market value, which is influenced by external factors, as well as the book value (including the accounting policy) as having an impact on value of the intellectual capital of the company. According to the assumptions of the method it should be concluded that the examined companies (except some examples) do not have intellectual capital. Actually however, it must be emphasized that the value ratio below one does not confirm the lack of intellectual capital. The selected companies are in the industrial sector, and index values below expected values only confirm the fact that the basis of the foundation of the company are tangible assets. These results show an unsatisfactorily used intellectual capital, which could be appreciated by investors. On the other hand, the MOL Magyar Olaj and the Serinus Energy Inc. data demonstrate that intellectual capital in those companies provides an added value. Unfortunately, both companies are in a downward trend in recent years which suggests to us that investors are changing opinion about their ability to leverage profit by knowledge.

CIV method

The second method, which is presented in this part of the work is a model designed to show how the average company earned additionally using the current level of intellectual capital. The following will be an analysis of the results of companies thanks to which we get the answer to the question - how much a company could obtain in addition, if it would use its intellectual capital? On this

Table 2: IC value of companies from WIG- food industry index in the period 2012-2015 exemplified by the MV/BV method

Company	2012	2013	2014	2015
WAWEL S.A.	3,06	3,94	3,85	3,72
COLIAN HOLDING S.A.	0,67	0,78	0,80	0,90
ZAKŁADY TŁUSZCZOWE KRUSZWICA S.A.	1,34	1,35	1,81	1,58
KSG AGRO S.A.	0,78	0,70	1,78	- 1,21
INDUSTRIAL MILK COMPANY S.A.	1,03	0,96	2,69	0,74
KERNEL HOLDING S.A.	1,17	1,28	0,68	0,84

Source: Own elaboration based on financial statements of each company

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Table 3: IC value of companies from WIG- oil&gas index in the period 2012-2015 exemplified by the CIV method [PLN]

Company	2012	2013	2014	2015
EXILLON ENERGY PLC	-1 437 804,73	-1 796 661,71	-1 233 855,62	-271 665,57
GRUPA LOTOS SA	-13 877 558 261,46	-17 296 420 868,81	-12 021 652 590,79	-3 137 316 307,77
MOL MAGYAR OLAJ	-744 830617,08	- 868 403 306,73	- 603 345 386,08	-216 208 172,56
PGNiG SA	-15 831 993 932,51	-29 531 606 070,22	-27 675 945 240,30	-7 379 056 935,53
PKN Orlen SA	-39 176 591 244,74	-45 431 369 384,25	-30 937 475 932,33	-7 761 819 285,45
SERINUS ENERGY INC.	-236 241 634,36	-912 419 795,41	-783 711 284,51	-259 569 067,15

Source: Own elaboration based on financial statements of each company

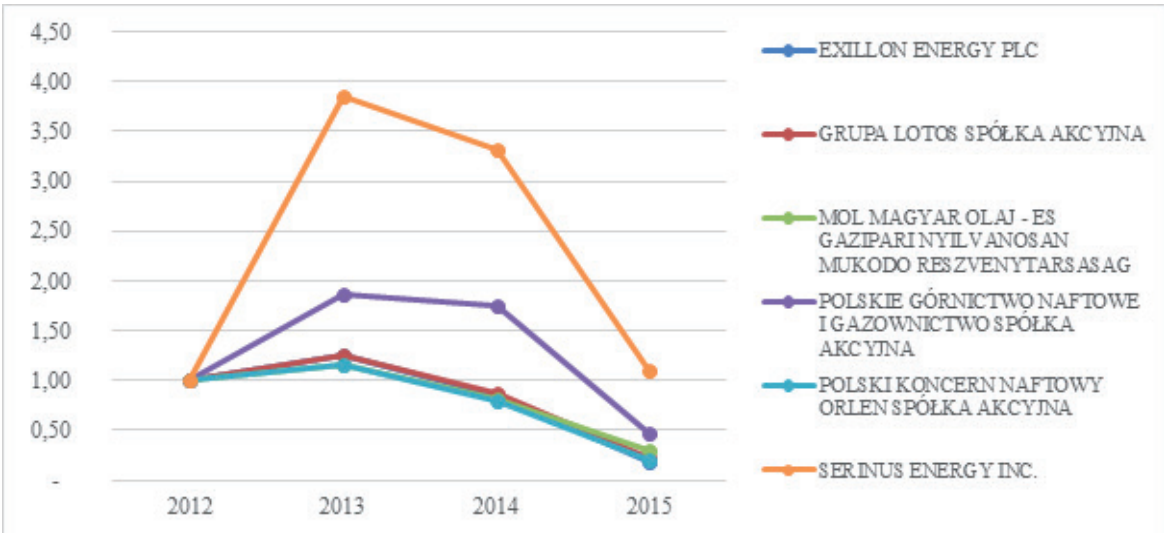
basis, will be assessed the potential of the intellectual share of owned capital by the examined companies. The measure is thus the distance to the values that the company could generate under optimum conditions which is making full use of intellectual capital.

It should be noted that "a premium property" informs us how much a company could gain if it owned the intellectual capital (in relation to firms from the sector). The discounted "bonus" is equivalent to the value of the intellectual capital of the company. Increasing the value obtained in the method CIV provides for expanding the ability to create further profits from intangible assets. Decreasing values indicate the inefficient use of intellectual capital, primarily through investment in tangible assets.

The CIV method describes a level of "company intellectual bonus", which is interpreted as intellectual capital of company. A "bonus" is able to be negative, which is described in data about six companies from the WIG- oil& gas index. This situation happens when a company is generating a loss. Because of negative values, the "intellectual bonus" as a part of company income is also below 0.

The chart below describes the dynamic of CIV rate changes between 2012-2015 in companies from the WIG- oil&gas index. The biggest change was noticed in Serinus Energy INC. between 2012-2015, but it takes the company almost to the same level. Moreover, a higher score of this index, because of negative results, shows big problems which the company could have in this time. On

Chart 1: The dynamic of CIV rate changes between 2012-2015 in companies from the WIG- oil & gas index



Source: Own elaboration based on calculation

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Table 4: IC value of companies from the WIG- food industry index in the period 2012-2015 exemplified by the CIV method [PLN]

Company	2012	2013	2014	2015
EXILLON ENERGY PLC	-101 727 795,08	-105 173 956,32	-107 721 322,42	-102 447 013,84
GRUPA LOTOS SA	-226 836 622,19	-212 596 513,66	-235 114 573,66	-231 836 641,29
MOL MAGYAR OLAJ	-533 559 419,79	-483 652 042,61	-426 615 915,26	-348 010 563,44
PGNiG SA	-69 494 731,64	-125 512 028,78	-201 632 310,28	-196 857 142,73
PKN Orlen SA	-205 879 915,17	-267 460 943,70	-381 269 261,64	-413 421 513,84
SERINUS ENERGY INC.	-236 241 634,36	-912 419 795,41	-783 711 284,51	-259 569 067,15

Source: Own elaboration based on financial statements of each company

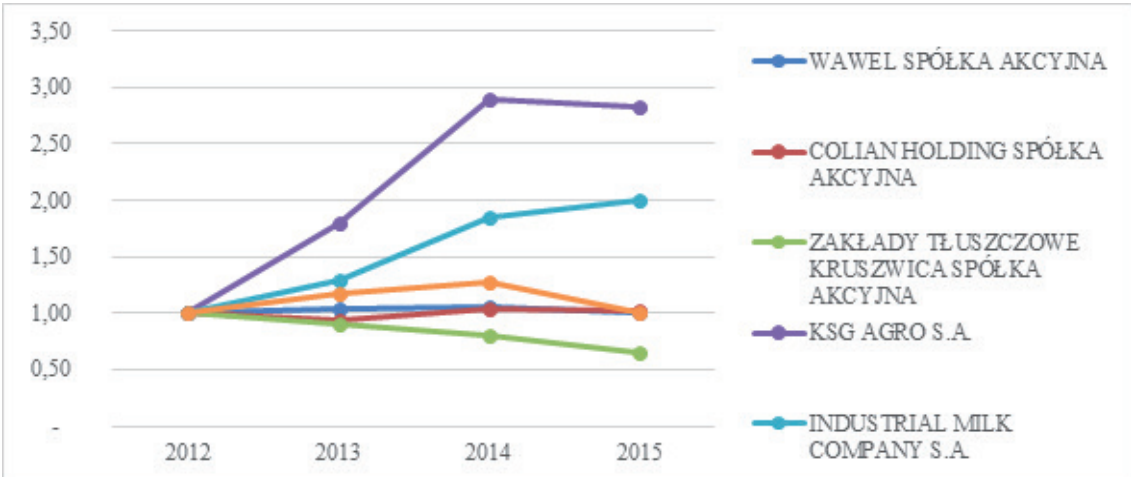
the other hand, we should point out that in the group of WIG- oil&gas index companies we are able to observe a bearish trend of intellectual capital income. Furthermore, in 2015 three of six companies noticed smaller losses from this "intellectual" part of the business, which suggests that they are trying to maintain good intellectual capital management.

As before, the situation of intellectual capital use in the food sector shows that in all of the observed companies we noticed negative results. Three of the companies were in a stable situation and one in an upward trend. On the other hand, there are two companies where the CIV-rate went down: KSG Agro S.A. and Industrial Milk Company S.A.

The chart below describes the dynamic of CIV rate changes between 2012-2015 in companies from the WIG-food industry index. As stated, the intellectual capital situation in the food industry is stable for most of the companies. The results of Zakłady Tłuszczowe Kruszwica S.A. shows that there are some examples where intellectual capital management improved the situation of the company. Unfortunately, all of the companies showed a negative CIV rate for 2012 -2015.

The models proposed above are the simplest and the most popular methods from the group selected for analysis in this paper. Whereas these are very simple cases, it should be emphasized that it is crucial to pay attention to the selection of appropriate methods in measurement of IC in a company, and fidelity when

Chart 2: The dynamic of CIV rate changes between 2012-2015 in companies from the WIG- food industry index



Source: Own elaboration based on calculation

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practicing it in a company in order to observe the changes. A properly selected way of measurement, affiliation to the sector, the nature of business, the perception by the market (significant when using models from a group of methods based on market capitalization) - such factors should be analyzed with the knowledge that they also have a significant impact on the result.

Conclusion

There is no doubt that among factors which drive the economy, next to material capital and labor, we include also knowledge. In highly developed countries,the idea of intellectual capital just discussed is even considered "the key to success in the 21st century" (Jarugowa & Fijałkowska, 2002, p. 7), but only in a situation where it is defined and allocated correctly. One of the steps in the proper management of this capital is a precise definition of its value in a given situation and time. Unfortunately, due to the lack of requirements for measuring intellectual capital of companies, experts point to countless methods of approximating it; these are not exact and lead to the creation of more or less precise estimations on this subject. It is worth mentioning that thanks to their capacity to show tendencies for change in the value of the intellectual capital, they can be useful for outlining the general picture of the value of the intellectual capital in a given enterprise at a given time (Beyer, 2014, p. 18).

Unfortunately, each of the methods and definitions proposed in the literature has positive and negative characteristics. The most common method is comparing the market value to the book value of an organization. This is connected to the opinion that the enterprise is judged not only through the prism of the assets it possesses but also through the intangible assets possessed- one of them being intellectual capital.

For better illustration of the research a table showing the most important differences between the MV/BV and CIV methods is presented. In this way, flaws and advantages of their use in business analysis are shown.

Table 5: Differences between the MV/BV and CIV methods

MV/BV method	CIV method
Indicator method (relations between two values)	Expresses the size of IC as a value in monetary units
Based on market capitalisation	Based on the ROA indicator value (of the company and the sector, conditioning the final result)
Assumes the IC to be the difference between the market value and the book value of the company	Assumes that the value of IC corresponds to its capability to overcome an average competitor with similar resources
The result is defined as the capability (or the lack of it) to create the values of IC	Determines the gross value of possessed intangible assets and provides information on whether investments in intangible assets are profitable for the company
Simple to compute	Complicated to compute: computing comprises of 7 stages, in which financial data – mostly coming from financial statements for the previous 3 years – are needed
Interpretation of the final result: value higher than 1 means that the company has IC (ie. surplus over the book value)	Interpretation of the final result: average profit gained thanks to IC of the company in relation to competitors or how much a company could obtain in addition, if fully owned would use its intellectual capital
The biggest flaw: it compares two methodologically different values – book value and market value	The biggest flaw: takes book values from the previous three years into account, which is associated with an individual investment cycle of any company – it is reflected upon the final value
Little resistance to market factor; depends on the market value	Takes market factor too little into account; averages the used values

Source: Own elaboration based on literature review

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Nowadays methods proposed in literature do not describe precisely the amount of intellectual capital of companies, but are helpful to define the company situation in the aspect of IC – in trying to answer whether that firm has this type of capital and to observe changes in time. Scientists are still trying to find the single most accurate and proper method. Unfortunately, intangible assets such as intellectual or human capital without a single proper definition are difficult to estimate, but indisputably are very necessary to research.

Understanding the value of the factor (that is intellectual capital), which managers must manage, makes it easier to control processes linked to the effective use of the potential owned and generated. It is also important to remember that intellectual capital allows for creating an advantage over the competition only when the circumstances are right; the way of making sure to create those circumstances is to invest systematically in the sphere of human capital. The obtained analysis pertaining to the level (or value) of the intellectual capital of enterprises forms the base for future research where other available methods and measurement tools will be used.

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