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THE CONCEPT OF INTELLECTUAL CAPITAL AND ITS MEASUREMENT USING THE VAIC™ METHOD ON THE EXAMPLE OF PKN ORLEN[1]

Summary

Purpose – The main purpose of the paper is to systematize the concept of intellectual capital of an enterprise, assess the effectiveness of the use of intellectual capital and analyze its impact on the added value.

Research method – The paper uses the intellectual capital analysis method during the period 2009-2017 using the VAIC™ intellectual added value factor and is based on data from financial statements. The basic statistical tool, which is the arithmetic mean was also used for the study.

Results – The study showed that the intellectual capital of PKN Orlen is increasing as is the difference between the market and accounting values of the company. The main source of growth is human capital.

Implications – The result of the study are conclusions in the form of practical recommendations for PKN Orlen in the area of intellectual capital development.

Key words: intellectual capital, methods of measuring intellectual capital, VAIC, enterprise

JEL Classification: D24, E22, O12, O34

1. Introduction

The increasing importance of non-material resources in the global economy has inspired scientists to seek the reasons of the divergences between the book value and the market value of enterprises. As a result, intellectual capital as well as its value and impact on other resources have been identified as the main reasons of this divergence. Consequently, intellectual capital became the subject of study not only in the domain of accounting but also in the entire field of economics. The enterprise theory connected with resources was pursuing those factors that determine the competitive advantage. Primarily, it appeared that the key factors are material resources and their effective development. However, owing to detailed analysis, the

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economist – E.T. Penrose showed that human resources and their effectiveness in combination with material resources create the competitive advantage [Becker, 1962, pp. 9-49].

The aim of the theoretical part of this paper attempts to systemize the knowledge on intellectual capital at the level of enterprises. At the empirical level the capital of the company PKN Orlen was measured in the years 2009-2017 using the Value Added Intellectual Coefficient method (VAIC™). The selection of this particular company was dictated by two main reasons. Firstly, PKN Orlen is the largest enterprise in Poland and secondly, PKN Orlen has a large impact on the development of the Polish national economy. Due to the fact that the VAIC™ method is considered to be a reliable one and the obtained results are objective as the data necessary for the calculations was taken from financial reports made in accordance with the accounting reliability principle), the author of the paper decided to select this method. The results of the studies enabled the analysis of the enterprise's intellectual capital in the years 2009-2017, taking into consideration the evaluation of the development sources.

The paper aims to answer the research question as to whether human capital in PKN Orlen constitutes the main reason of growth and the difference between the market value and book value.

2. The development of the concept of intellectual capital

The first observations relating to intellectual capital were made in the 1930s by E. Chamberlin, who started the discussion on the importance of resources for achieving profits. The scientist laid the foundation for the resource-based theory of an enterprise created by E.T. Penrose. In accordance with Penrose's theory, competitive advantage is achieved by enterprises thanks to the possession of unique material and non-material resources and their effective combination. However, as regards the genesis of the concept of intellectual capital, many scientists point to the year 1969 as a particularly crucial year because for the first time the concept of "intellectual capital" was used by J.K. Galbraith in his letter to the Polish economist M. Kalecki.. In 1969 Galbraith wrote "I wonder if you are aware of how many of us (people) in the world have been using for decades the intellectual capital provided by you" [Jashapra, 2006, p. 340]. In general, the concept of intellectual capital was created mainly as the result of the increasing role of knowledge in the contemporary world, innovativeness, the development of information technologies and the increasing role of other non-material resources.

In 1969 the Nobel Prize winner J. Tobin elaborated *q* coefficient which reflects the relationship between a company's market value and its book value. Consequently, there appeared an opportunity to assess intellectual capital (q coefficient took into consideration the capitalized values of the future net receipts). Tobin [1969, pp. 15-29] associated intellectual capital with organizational capital, the capital ensuing from reputation, the pension from monopoly or the possibility of new

investments. More than 10 years later H. Itami introduced the concept of invisible resources and was referring to: the technology, the trust of clients, the image, the brand, the organizational culture and management skills [Itami, Roehl, 1987, p. 12]. Attention should be drawn to the relatively long period of time between these events. As late as the early 1970s and also in the 1980s economists began to notice the significance of intellectual capital.

Another important event was the publication (in 1988) of the so called Konrad Report and the elaboration entitled "The Invisible Balance Sheet" by K.E. Sveiby [1988], who was working on these projects together with a group of friends. Seven Swedes stated their critical views on the dominating process of preparing financial reports. The Konrad Report constituted a reply to the increasing importance of non-material assets, with a particular focus being paid on the employee's potential, the enterprise's culture and other intangible assets which are not taken into consideration in financial reports. The Konrad Report, which was treated as the supplement to a financial report, isolated financial capital and intellectual capital within one capital of an enterprise. It appears that the Konrad Report was the determinant of the future development of works concerning intellectual capital. It is assumed that this report became the basis for all future concepts of intellectual capital.

In 1991 the Swedish company Skandia AFS established the position of director of intellectual capital – the first of its nature globally. L. Edvinsson was appointed to this role. In the same year the position of Navigator was created by Skandia –and it is considered as the fully-fledged model for management and the measurement of intellectual capital. In 1992 R. Kaplan and D. Norton introduced the concept of the Balanced Scorecard which constituted the third instrument for measuring intellectual capital that has been created within a three year period. It took only three years (after L. Edvinsson was employed as the director of intellectual capital) for the organization Skandia to publish the report of Skandia Navigator "Visualizing Intellectual Capital", which described in detail the state and methods utilized in the measurement of intellectual capital. The idea behind the report implied that traditional financial reports represent only the past financial results of the enterprise. Meanwhile, intellectual capital is more advanced owing to its understanding of both the past and present development possibilities of an enterprise [Edvinsson, 1997, pp. 363-373]. Skandia developed the basic principles of combining the traditional financial reports with methods of measuring intellectual capital. Firstly, Skandia Navigator became the guide for enterprises on how to effectively manage intellectual capital. Secondly, it aims at directing the employees' actions by using a comprehensive set of measurement instruments that reflects the real resources, the development possibilities and the future potential of an enterprise. In 1995 The World Trade Organization (WTO) signed an agreement on the commercial aspects of intellectual property. The reaction of the WTO confirmed the outstanding importance of the Skandia Navigator report for the development of intellectual capital. More frequent discussions on how to regulate legal provisions not only in accounting, but also in trade, law, insurance and in the protection of intellectual

rights were observed. Other scientists also analyzed the essence of intellectual capital. In 1997 and on the basis of The Konrad Report, Sveiby [1997] elaborated the Intangible Assets Monitor (IAM), which is based on the fact that non-financial indicators ought to complement the financial ones. Additionally, Sveiby stated that the market value of an enterprise is composed of the non-material assets and the new book value. J. Ross together with his associates suggested in 1997 that it is necessary to create one universal indicator of intellectual capital. In 1997 T.A. Stewart defined intellectual capital as: "the intellectual material that was formalized, captured and used for creating (via production) assets that are assessed as better in terms of their quality". It emphasized how simply intellectual capital was associated with an employee and their attributes for the creation of added value. In the same year Stewart suggested the following three instruments of measurement : the indicator of the relationship between the market value and the book value of an enterprise, Tobin's q coefficient and the sum of intangible assets as the method of measuring intellectual capital at the level of an enterprise. The general idea of the aforementioned three methods of measurement is that the enterprise's value set by the market ought to be juxtaposed with the enterprise's value shown in the company's balance sheet. The difference between these values was associated with intellectual capital [Stewart, 1997].

In 1999 international organizations reacted to the increasing interest in intellectual capital. The OECD co-financed the international symposium on intellectual capital which was held in Amsterdam. Additionally, the Danish Confederation of Professional Unions presented its own model of intellectual capital. The event that changed the direction in which the theory of intellectual capital was developing, was the scientific project known as Meritum. This particular project was financed by the European Union and aimed to recognize in detail and systemize the theory of intellectual capital. During the symposium scientists isolated the following capitals: human capital, structural capital and relational capital. Intellectual capital was specified as the effect of mutual relations between capitals in the process of creating the value of an enterprise. Human capital was associated with the knowledge, abilities, experiences and competences of employees. It was established that human capital is connected with particular individuals and it is partly universal and available for everyone. The examples of human capital are experiences acquired in the past, group management skills, know-how, time management, trust and credibility. The Meritum project demonstrated that structural capital is determined through the effective usage of knowledge, whereas its results remain within an enterprise at the end of each day. Structural capital includes traditional activities, procedures, systems and databases. Most of them are legally protected and constitute the possession of the enterprise. Relational capital is defined as the company's assets connected with the external entities (contractors, clients, suppliers). This capital includes the elements of both human and structural capital which are related to: the stockholders, owners, shareholders, clients and trade partners. The examples are: the company's reputation, brand, customer satisfaction and loyalty levels, the relations with the interested parties, long-term trading

contracts [Urbanek, 2008, p. 40]. The consequence of the scientific project named Meritum was the publication (in the year 2000) of the first scientific "Journal of Intellectual Capital", which constituted a response to the increasing number of questions regarding the theory of intellectual capital.

Before 2004, the events connected with the theory of intellectual capital evolved from the private sector. In reality, the corporate world gave the go-ahead for the domain of science in relation to the issues connected to intellectual capital, rather than the other way round. The increasing differences between the market and book value of enterprises became the subject of interest for the entire economic world. In 2004, D. Andriessen and Ch. Stam published the report entitled "The Intellectual Capital of the European Union". Subsequently, an attempt was made to analyze intellectual capital at the macroeconomic level while using Skandia Navigator [Andriessen, Stam, 2004]. In 2011 The International Integrated Reporting Council (IIRC) was formed thanks to the initiative of the International Federation of Accountants (IFAC), the Global Report Initiative (GRI) and the Accounting for Sustainability. Furthermore, Lin and Edvinsson [2010] published a report entitled "The National Intellectual Capital'. The report analysed a total of 40 countries during the years 1995-2008. It is important to keep in mind that presently the baseline concept of intellectual capital is the model suggested by Edvinsson. It is based on the division of intellectual capital into two categories, i.e. human capital and structural capital [Edvinsson, Malone, 2001, p. 28]. It indicates the relatively large importance of intellectual capital not only with reference to an individual – human capital, but it also regards an organization – structural capital which constitute the parts of the entire economy.

The golden years of the theory of intellectual capital comprised 1989-2000, when intellectual capital was defined for the first time and then, as the result of the first methods of estimating intellectual capital, it became the desired object of research for economists. Simultaneously with the observed increasing importance of intangible assets in the creation of the enterprise's value, many scientists began to analyze the subject related to intellectual capital and its measurement. Initial attempts to create quality financial instruments to find an answer to the question of how to measure intellectual capital were made The ability to measure intellectual capital will enable having an impact on it. Intellectual capital requires constant analysis by economists and the creation of new instruments of measurement and the development of the theory of intellectual capital.

In the subject literature the most popular interpretation of intellectual capital is the statement that intellectual capital is the difference between the book value and the market value of enterprises [Edvinsson, Malone, 2001, p. 39]. Many authors associate the invisible difference with knowledge that is the main non-material resource that generates the enterprise's added value.

Most intellectual capital analysts isolate its three components: human capital, organizational (structural) capital and relational capital. The adopted division reflects various locations of the elements of intellectual capital in an enterprise [Michalczuk, 2013, p. 102]:

- human capital, as the sphere of intellectual capital, includes such non-material resources as: knowledge, education, experience, training, the ability to create information, entrepreneurship, innovativeness, motivation and attitude;
- organizational (structural) capital – patents, copyrights, trademarks, brand, brand names, the organizational culture, network systems, management systems and databases;
- relational capital (related to clients) – the base of clients, loyalty and satisfaction of clients and reputation.

The aforementioned division of non-material resources enables the recognition of its particular components. It is important to develop all three elements of intellectual capital. The lack of development of human capital results in the absence of development of the capital related to clients. For example, without learning and the development of marketing of relations it is impossible to guarantee the loyalty and satisfaction of clients. Another example is the situation where it is impossible to create new patents without the development of the innovativeness sphere. The number of such relationships is so large for the following reasons: firstly, due to the universal character of non-material resources, and secondly owing to the possibility of limitless secondary usage of human capital. The identification of particular non-material resources within a certain capital and later on the creative combination of non-material resources informs managers which field was not used and may become a new source of competitive advantage. The resources of human capital appear to be a crucial area as they determine the usage of other non-material resources.

3. The measurement of intellectual capital

Nowadays the methods of measuring intellectual capital may be qualified into one of two groups. The first group is created by the methods connected with the evaluation and measurement of particular components of intellectual capital. This group includes Skandia Navigator. The second group comprises the measurement of non-material factors in financial categories at the level of an enterprise without reference to particular components of intellectual capital. The indicator of the current situation of the economy for stockholders is the way managers efficiently manage other capitals and intellectual capital. Furthermore, the measures expressed in financial values, which include in their results the synergy between the components of intellectual capital at the level of an enterprise ensure the key measurement of advancement and values [Luthy, 1998, p. 5].

The methods of measuring intellectual capital and thus also non-material resources may have a different character and hence provide diverse information. The measurement of non-material resources may provide information of a static or dynamic nature. Within such methods it is possible to analyze particular resources or describe non-material resources as the entirety. The information may have either characteristics of quantity or quality and be addressed at either external or domestic

interested parties. Additionally, the measurement may be based on complex calculations. Sveiby systematizes the methods of measuring intellectual capital and divides into at least four categories [Beyer, 2013, p. 606]:

- Direct Intellectual Capital Methods which enable the recognition of particular elements of intellectual capital and further on the estimation of the monetary value of these components, i.e. non-material resources. This group includes: The Technology Broker Model, The Value Explorer™), model IVM™ (Inclusive Valuation Methodology), IAV method (Intangible Assets Valuation), the TVC model (Total Value Creation) and the AFTF model (Accounting for the future);
- Market Capitalization Methods (MCM) which are connected with determining what is the difference between market capitalization of an enterprise and its book value. It is believed that the difference constitutes the value of intellectual capital, and thus of non-material resources. In these methods the value of intellectual capital is specified using monetary units. As the example one may provide among others Tobin's „q", Market Value to Book Value (MV/BV) and the Investor Assigned Market Value (IAMV™);
- Return on Assets Methods (ROA) which are connected with dividing the average profits prior to the taxation of enterprises in a certain time period by the average value of intangible assets in the same period. Further on, the obtained result is compared with the average results of the enterprises functioning in the same branch, whereas the obtained difference is multiplied by the average value of tangible assets in order to specify the average annual revenues from intangible assets. The value of intellectual capital is estimated by dividing these revenues by the average cost of the capital. This group includes such methods as: Economic Value Added (EVA), the Calculated Intangible Value(CIV), Knowledge Capital Earnings(KCE™), The Value Added Intellectual Coefficient(VAIC™), Human Resources Costing (HRA);
- Scorecard Methods (S.C.) are the only methods that mainly aim to identify accurately the particular components of intellectual capital. These methods only use quality measures and create the holistic reports on the level of intellectual capital. This group includes: the Balanced Scorecard (BSC), Skandia Navigator, The Intangible Assets Monitor (IAM), IC-Rating model and IC-Index and Holistic Value Approach (HVA).

The measurement of intellectual capital in an enterprise is connected with the necessity to overcome many problems, including mainly: the lack of measurability of important factors, the lack of proper adjustment of the research instruments, the analysis of improper areas, the lack of presentation of useful information using the results [Probst et al., 2000, pp. 248-250]. The difference between the enterprise's market value and the book value constitutes a perfect example of how difficult it is to measure intellectual capital.

4. The characteristic of the VAIC™ method

The VAIC™ method was used in order to analyze intellectual capital. The method does not require complex calculations, while the obtained results may be considered in the context of a certain market, branch or market economy in which a certain enterprise is functioning.

The author of the Value Added Intellectual Coefficient (VAIC™) is Pulic [2004] from the Austrian IC Research Centre. This method is based on the return on assets (ROA), which, in turn, is based on three types of capital present in an enterprise: physical capital, human capital and structural capital. The main assumption is that the added value enables the determination of an enterprise's activity, while intellectual capital is the factor that determines the creation of the added value.

In the VAIC™ method, added value is referred to as the company's revenue. In this way it forces the interpretation of intellectual capital in the monetary perspective. Owing to this, the advantage of the VAIC™ method is its objectivism which contributes to its universal usage. The obtained results are compared with the enterprises functioning in the identical market segment, branch or the national economy. This method enables the evaluation of the effectiveness of the invested intellectual capital and physical capital in the generation of income.

A more frequent practice among the contemporary scientists is the analysis of the dependency connected with the application of the VAIC™ method with the basic measures of the effectiveness of the enterprise's functioning. K. H. Chan [2009, pp. 22-39] presents the relationship between VAIC, ROA and ROE and the enterprise's turnover and the book value. Meanwhile, Greek scientists show the relationship between human capital and ROA [Maditinos et al., 2011, pp.132-151]. The subsequent research confirms the relationship between VAIC and such indicators as ROA and ROE [Komnenic, Pokrajcic, 2012, pp. 106-119]. Therefore, it is necessary to use the VAIC method in the empirical research in order to determine the relationship and dependencies between this method and other indicators.

The application of the VAIC™ method takes place in five stages. The starting point and the final operation is the following formula [Pulic, 2004]:

$$VAIC = CEE + HCE + SCE$$

where:
VAIC – the indicator of the intellectual added value,
CEE – the indicator of the effectiveness of physical capital,
HCE – the indicator of the effectiveness of human capital,
SCE – the indicator of the effectiveness of structural capital.

Stage 1. The calculation of the enterprise's added value (VA) on the basis of the following formula:

$$VA = OP + HC + A$$

where:
VA – added value,
OP – operational profit,
HC – human capital,
A – amortization

Stage 2. The calculation of the indicator of the effectiveness of intellectual capital in accordance with the following formula:

$$ICE = HCE + SCE$$

where:
ICE – the indicator of the intellectual effectiveness,
HCE – the indicator of the effectiveness of human capital,
SCE – the indicator of the effectiveness of structural capital.

Stage 3. The calculation of the effectiveness of using human capital in creating the added value.

The value of human capital corresponds to the total expenditures connected with salaries, education and training (the total remunerations from the payroll and the working costs). At this stage we use the following formulae:

$$CEE = VA/CE$$

where:
CEE – the indicator of the effectiveness of physical capital,
CE – physical capital (the book value of net assets)

$$HCE = VA/HC$$

Stage 4. The measurement of structural capital and the calculation of the effectiveness of using it.

According to Pulic [2004] the value of structural capital (SC) constitutes the difference between the added value (VA) and human capital (HC).

$$SC = VA - HC$$

where:
SC – means structural capital.

The effectiveness of using structural capital in creating the added value is calculated using the following formula:

$$SCE = VA/SC$$

where:
SCE – means the indicator of the effectiveness of structural capital

Stage 5. The determination of the VAIC indicator

$$VAIC = CEE + HCE + SCE$$

The obtained result provides information on the effectiveness of using physical capital, human capital and structural capital in the analyzed enterprise.

5. The application of the VAIC™ method for the measurement of the effectiveness of using intellectual capital in PKN Orlen

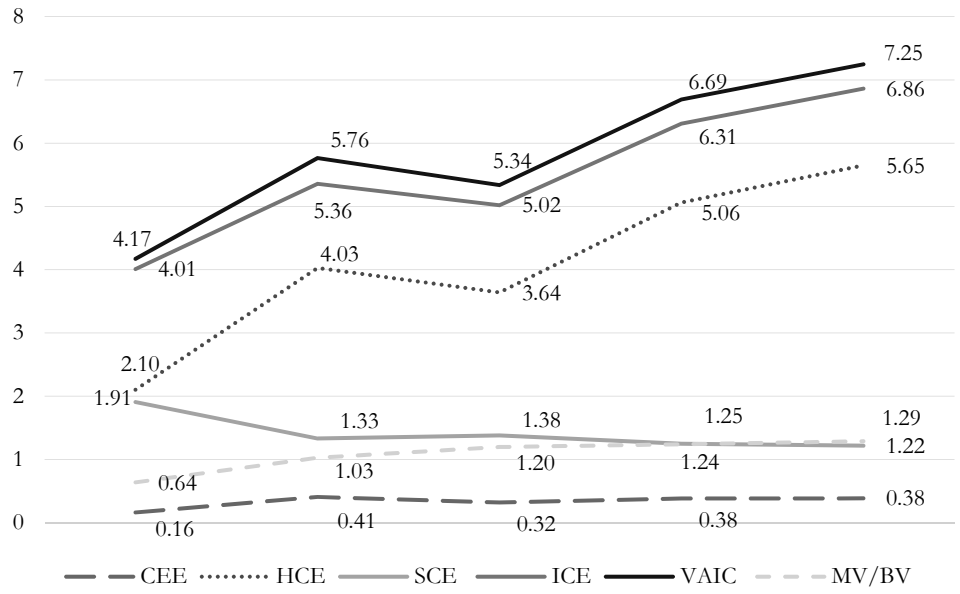
PKN Orlen is the largest Polish petrochemical company in the fuel and energy sector. The company employs more than 20,000 employees. It operates not only in Poland but also in the Czech Republic, Germany and Lithuania. The company's mission is reflected in the following motto: "We discover and process natural resources to fuel the future". PKN Orlen is the market leader in the production of petrochemicals. The company is now exploring and extracting hydrocarbons from unconventional sources located in Canada. As the only Polish company PKN Orlen was ranked among the largest global companies in the magazine "Fortune 500". The State Treasury is the shareholder of PKN Orlen and possesses 27.52% of all its shares [www 1].

The data used in the research was obtained from the financial reports of PKN Orlen [www 2]. The years 2009-2017 were considered as the analyzed period and were chosen due to the availability of data. The calculations were made in accordance with the algorithm presented in the previous part of this paper. The results obtained are presented in chart 1.

The interpretation of the obtained results is connected mainly with the specification of to what degree an enterprises created the added value from each monetary unit invested in both material and non-material resources. During the analysis of the results of the indicator of the intellectual added value (VAIC) attention should be drawn to the progressing increase in the years 2009-2017. PKN Orlen used human resources most effectively in 2017 and achieved HCE at the level of 5.65 from each invested PLN, whereas in 2013 it amounted to only 2.10 – the lowest value. However, in 2009 HCE oscillated at 2.83. Therefore, in 2017 there was increase by approximately 200% when compared with the year 2009.

CHART 1

The analysis of the financial results of PKN Orlen in the years 2013-2017 while using the VAIC method



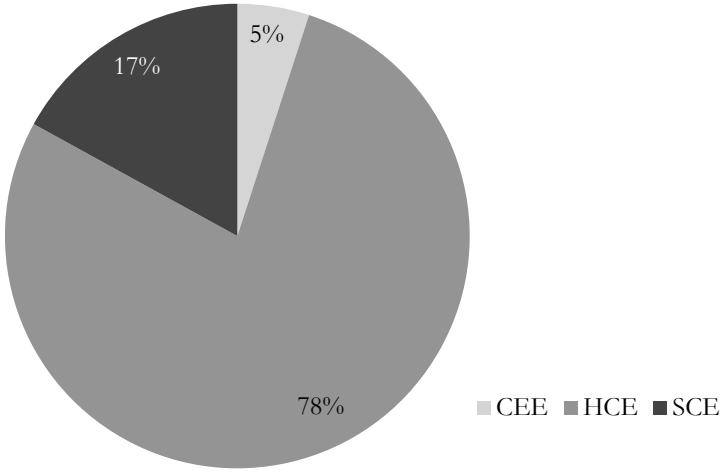
Source: own elaboration on the basis: [www 2].

In the years 2011, 2012 and 2015 the VAIC indicator decreased in comparison with the previous year. At that time the value reductions were observed as regards the indicators of the effectiveness of physical capital and human capital, whereas the value of the indicator of the effectiveness of structural capital increased. The reasons of such dependence ought to be explained by the reduction in investment outlays in the sphere of human capital and the increase of outlays in the sphere of structural capital, i.e. on such resources as: network systems, management systems, databases and trademarks. Structural capital, or in other words organizational capital, is focused on untypical non-material resources that are produced by an employee but remain in an enterprise. Enterprises such as PKN Orlen in certain periods, for example, undergo brand changes or changes in the management board, which may be the result of a larger amount of invested funds in the structural capital.

Chart 2 presents the structure of the share of the effectiveness of physical capital, human capital and structural capital in 2017 which together create the VAIC indicator. The aim of it is to present the current state of particular elements of the VAIC indicator within PKN Orlen.

CHART 2

The structure of the share of the effectiveness of physical capital, human capital and structural capital in 2017



Source: own elaboration on the basis: [www 2].

During the analysis of the data it was observed that it was human capital that created the VAIC indicator to the largest degree in the years 2009-2017. In 2009 the relation of particular indicators of the effectiveness of capitals is as follows: CEE – 6.9%; HCE – 75.7%; SCE – 17.4%. In 2010 the percentage share of particular indicators increased insignificantly and is as follows: CEE – 6.4%; HCE – 78.3%; SCE – 15.3%. It should be noted that despite an increase in the indicators of the effectiveness of physical capital its percentage share decreased in comparison with the previous year while the VAIC indicator increased. The reason of this situation is considerable increase as regards to the indicator of the effectiveness of human capital. In 2011 all of the indicators of effectiveness decreased in comparison with the previous year, which resulted in the general decrease in the value of the VAIC indicator. Particular indicators of effectiveness oscillated at the following levels: CEE – 5.9%; HCE – 77.34%; SCE – 16.76%. However, in 2013 the percentage share of particular effectiveness levels of capital creating the VAIC indicator is as follows: CEE – 3.8%; HCE – 50.3%; SCE – 45.9%. In 2014 the elements of the VAIC indicator had the following percentage shares: CEE – 6.9%; HCE – 70%; SCE – 23.01%. The turn of 2013 and 2014 indicated that the share of human capital in the creation of the added value oscillates at almost 20% increase. Simultaneously with the increase of human capital there can be observed an increase in the relationship between the market value and the book value of the enterprise (MV/BV). This, in turn, shows that the increase in the outlays on human capital results in the higher value not only of the book value, but chiefly of the market value. The difference between these two values indicates that intellectual capital

increased due to larger investment outlays in the sphere of human capital. From 2009 to 2013 the book value of the enterprise was higher than its market value. Since 2014 its market value has been higher than the book value, which is presented in the MV/BV indicator. Furthermore, in the subsequent years the share of human capital in the creation of the added value looked as follows: 2015 – 68.2%; 2016 – 75.7%; 2017 – 77.9%. The dynamics of the share of human capital in the creation of the added value in 2016 in comparison with 2015 amounted to nearly 111%, i.e. the share increased by approx. 11%. In the subsequent year it amounted to as much as 103%, i.e. the share increased by 3%. The dynamics of the increase of MV/BV indicator in the years 2015-2017 oscillated as follows: MV/BV indicator in 2016 in comparison with 2015 amounted to approx. 103.4%, which shows the increase by 3.4%; a year later it amounted to 103.96%, which indicates the increase by 3.96%. The aforementioned results enable the formulation of the thesis that the main source of the increase in the market value of PKN Orlen is the increase in the effectiveness of human capital.

Another conclusion from the aforementioned research regards stable increase in the indicator of the effectiveness of intellectual capital (ICE). In the years 2009-2012 this indicator underwent numerous fluctuations. However, in 2013 the ICE indicator amounted to more than 4, while in 2017 it amounted to approx. 6.86. In 2013 the ICE indicator comprised HCE and SCE indicators amounting to 52.43% and 47.53%. On the contrary, in 2017 the same indicator in the form of HCE and SCE oscillated at 82.29% and 17.71%. Throughout 5 years, more than 30% increase in the share of HCE creating ICE shows that PKN Orlen during the selection of the direction of creating intellectual effectiveness focused on the development of human capital instead of the structural one. From the perspective of the present day this decision appears to be proper owing to the increasing market value and book value of the enterprise.

On the basis of the aforementioned research the author draws practical conclusions in the form of recommendations for PKN Orlen:

- the successive allocation of funds in human capital, which constitutes the basis for the indicator of intellectual effectiveness;
- the exploration and development of new areas of human capital, which will be the incentives of the enterprise's development;
- the continuation of research in the following years using the VAIC indicator in order to monitor the sources of the enterprise's development.

6. Conclusions

The concept of intellectual capital is continuously developed by the largest representatives involved in non-material resources owing to the importance of intellectual capital in the creation of the added value and the real impact on the creation of the enterprise's value. The measurement of intellectual capital is difficult owing to the impossibility of capturing some of its elements and the small number

of the available measurement methods. One of the first numerical measurement methods is the VAIC™ method which (thanks to its simplicity and a wide range of the possibilities to evaluate results within a longer time period) became one of the most popular methods of measuring intellectual capital in the world. On the basis of the VAIC™ method used in the largest Polish enterprises, PKN Orlen, it needs to be noted that simultaneously with the dynamic increase in the share of human capital in the creation of the added value there increases the enterprise's market value and also the relation between the market value and the book value. The research results were necessary for the evaluation of changes in the time perspective in PKN Orlen and it was possible to answer the research question by stating that human capital is the main source of the increase. The recommendation for PKN Orlen is the instruction to continuously increase the investment outlays in the sphere of human capital. It is recommended to analyze more thoroughly particular elements of human capital because (as the aforementioned research has shown) the development of human capital to the largest degree determines the increase of the added value, the increase of the indicator of the effectiveness of intellectual capital, the increase of the VAIC™ indicator, the increase of the market value and the book value, which contributes to the development of the entire enterprise. The continuation of research using the VAIC indicator in the following years will enable the supervision of the development of particular indicators of effectiveness.

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