Practical Application of Selected Methods of Intellectual Capital Valuation: A Research Study

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Abstract:

Purpose: *Reports on non-financial data include elements identified in the structure of intellectual capital, whose proper valuation is a challenge for business. The purpose of this study is to show the legal framework of the analysis, reporting and valuation of intangible assets and practical applications of selected methods of intellectual capital valuation on the example of the brewing industry.*
Design/Methodology/Approach: *The methods selected for the purposes of this case study are the market value to book value ratio, the calculated intangible value index, the Tobin's q ratio and the value-added intellectual coefficient. Calculations were made based on data from reports of a selected joint-stock company from the brewing industry.*
Findings: *The carried out intellectual capital valuation has confirmed that applying only one valuation method does not give a fair view of intangible assets, and the lack of considering context in the valuation makes the obtained data lose its decision-making value.*
Practical Implications: *A new approach to the process of intellectual capital valuation, based on long-term integration of selected valuation methods as well as on consideration the context of the analyzed numbers, has been proposed.*
Originality/Value: *The results are original because they can be used to develop future intellectual capital valuation scenarios. They constitute a kind of "guide" for intellectual capital managers.*

Keywords: *Intellectual capital, valuation, MVA, MV/BV, Tobin's q ratio, CIV, VAIC.*

JEL classification: *M20, O34.*

Paper Type: *Research study.*

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1. Introduction

In order to carry out analyses reporting and valuation of the intellectual capital standard, it is necessary to take multifaceted actions to identify intangible assets (Fischer and Marsh, 2014; Niculita, Popa and Caloian, 2012). Although it is still not possible to assign monetary values to most generated intangible assets, they nevertheless need to be considered in the process of value creation (Starovic and Marr, 2003). According to International Financial Reporting Standards, intangible assets are identifiable, non-monetary assets and without physical substance. They can be capable of being separated and sold, licensed, transferred, exchanged, or rented separately and arise from contractual or other legal rights (IFRS, 2018). Not only do companies need to learn to analyze and communicate their intangible assets in a more systematic way, but also financial analysts and investors have to be able to interpret this additional information and effectively integrate it into existing valuation procedures (EFFAS CIC, 2009). In 2008, the EFFAS Commission on Intellectual Capital developed *"Principles for Effective Communication of Intellectual Capital",* which still constitute basic reporting standards. Below are 10 selected rules based on studies on this topic (EFFAS CIC, 2009; Mierzejewska, 2009):

1. Transparent consideration of value creation in the future – an ideal index should be flexible and malleable so that it can be incorporated into quantitative valuation models.
2. Transparent methodology – companies should be able to explain how they have created the indices suggested in the evaluation.
3. Standardization – normalized intangible indices may be compared among companies.
4. Coherence in time – the selected set of indices must be as coherent over time as possible.
5. Compromise between confidentiality and disclosure of information – disclosing this type of information should always be preceded by thoughtful, internal decision-making processes within the scope of intellectual capital management.
6. Interests common to both companies and investors – progress in communicating intellectual capital can be achieved only through compromise between the interests of a company which provides information of increasing quality and quantity.
7. Preventing excessive collection of information – knowledge needs to be qualitative and useful to analyses and valuations.
8. Reliability and responsibility – information on intellectual capital should be a true and honest presentation of the internal measuring system or a result of transparent evaluation.
9. Risk assessment – identification of possible future events and the resulting probability of risks to a company's operational efficiency and results.

10. Manner (place and time) of communicating intellectual capital – information about a company's intellectual capital should be disclosed through efficient and effective communication channels, and the frequency of such disclosure should be appropriately planned.

The rules for communicating the knowledge about intellectual capital presented above constitute a tool that supports the measurement, disclosure and valuation of a company's intellectual capital, which makes measuring and management of intangible assets effective while increasing the efficiency of the allocation of internal resources. This is not an easy task due to the fact that intangible assets do not fulfil the conditions assigned to tangible assets (Caputa, 2008; Cohen, 2005):

–   in the majority of cases they have a subjective value that is different for different people, even in the perspective of the whole company, due to the diversity of organisational levels,
–   they are difficult to distinguish because these resources are valuable only in relation to other sources. As a consequence, they cannot be subject to transaction on their own. Their value is intrinsically linked to the value of the company (e.g. customers' loyalty, brand image),
–   they often exert indirect influence on the financial result of a unit, through a complex chain of identified cause-and-effect relationships.

In the face of ever-changing conditions under which companies operate, resulting from global changes and spaces for business operation, the traditional accounting system defined as a comprehensive system of identification, measurement, processing and communicating information about the financial condition and results of a company, is less and less capable of providing useful and sufficient information for a broadly understood group of internal and external stakeholders (Chojnacka and Wiśniewska, 2015; Soudani, 2012). Modern enterprises are longing for benefits of accounting information system, which can be evaluated by its impacts on improvement of decision-making process, intellectual capital valuation support, quality of accounting information, enterprises performance evaluation, internal controls and facilitating transactions.

As Niemczyk (2014) notes *"a contemporary accountant does not carry out valuation of knowledge resources controlled by a company, does not include them in the accounts or financial reports, thus making it impossible to conduct an economic and financial analysis of these resources and to interpret them for the purposes of the decision-making process. (...) classic financial accountancy and other related scientific fields, i.e. financial analysis, corporate finance, management accounting, controlling etc. are characterised by certain capitocentrism"*.

Relying on intangible assets, which has been observed in economic practices, resulted in changes to a universally understood company management process, for example intangible assets reporting. The obvious necessity to measure intellectual

capital is mainly a result of the increasing quality of companies' internal management system, but also improved external reporting and the needs resulting from articles of association as well as transaction needs (Blaug and Lekhi, 2009; Hussey, 2011; Urbanek, 2008). Models for the intellectual capital reporting are still at stage of development compared to those for material and financial resources. The theory of accounting should be adjusted to ensure a standardised and comparable approach for accounting and reporting on intellectual capital in corporate annual reports (Cronje and Moolman, 2013).

2. Methodology

Introduced to the Polish law by a directive of the European Parliament, guidelines on disclosure of non-financial information and diversity information by certain large undertakings and groups have promoted actions aimed at taking up the challenge of compiling first reports on non-financial data, which included elements identified in the structure of intellectual capital.

The provisions of the directive pointed to the fact that *"certain large undertakings should prepare a non-financial statement containing information relating to at least environmental matters, social and employee-related matters, respect for human rights, anti-corruption and bribery matters"* (EUR-LEX, 2014). One of such companies was Grupa Żywiec S.A., which has been publishing "Report on non-financial information of Grupa Żywiec S.A., and Grupa Kapitałowa Żywiec S.A.," on its website since 2017 (GKZ, 2020). By comparing the content of reports for 2017 (which also contained data from 2016, 2018 and 2019, we can see marked differences in the approach to the preparation, presentation, and scope of publicly disclosed information. This is a testimony to the growing awareness of the importance of certain non-financial information for the company's image (Clausen and Hirth, 2016). The data concerning such aspects as financial results, number of employees as well as financial and quantitative data from consolidated annual reports allowed analysts to create the following intellectual capital valuation indices (Fu, Singhal and Parkash, 2016; Kasiewicz, Rogowski and Kicińska, 2006; Nita, 2013; Zygmański, 2016):

1. MV/BV – market to book value ratio.
2. CIV – calculated intangible value index.
3. Tobin's q ratio.
4. VAIC[TM] – value added intellectual coefficient.

3. Results

3.1 Market to Book Value Ratio

MV/BV ratio, proposed by Stewart (1977), belongs to a group of methods based on market capitalisation. It constitutes the easiest indicator of intellectual capital

because it relies on a comparison between the market value and book value of a company. Table 1 presents calculations for Grupa Żywiec S.A. It is assumed that means a joint-stock company constitutes the sum of book value and intellectual capital value (Kasiewicz *et al.,* 2006; Paknezhad, and Ahmadkhani, 2012; Weaver and Weston, 2003; Zygmański, 2016), which also corresponds to the Skandia Navigator model (Adamska, 2019). The problem with market value is that it is dynamic, depending on the current market situation (Niculita, Popa and Caloian, 2012), and the proposed valuation method is static. It means that the MV/BV ratio is also calculated under constant conditions. MV/BV ratio is calculated as follows:

$$MV/BV = \text{market value (number of shares*price of shares) / book value} \quad (1)$$
$$\text{(assets - borrowed capital)}$$

Table 1. *MV/BV and MVA for Grupa Żywiec S.A., between 2016 and 2019 (in PLN thousand)*

Grupa Żywiec S.A.	2016	2017	2018	2019
number of shares	10 271 337	10 271 337	10 271 337	10 271 337
price of shares (in PLN)[3]	443.00	472.00	462.00	490.00
market value	4,550,202.29	4,848,071.06	4,745,357.69	5,032,955.13
book value	915,110	886,354	897,809	905,788
MV/BV	**4.97**	**5.47**	**5.28**	**5.56**
MVA	**3,635,088.29**	**3,961,717.06**	**3,847,548.69**	**4,127,167.13**

Source: *Authors' own elaboration based on data from (GKZ, 2020; BRa, 2020)*

MVA (Market Value Added) ratio has also been calculated. Table 2 presents a relation of MVA to human capital of Grupa Żywiec S.A. MVA represents value added to a given share in excess of its book value. MVA denotes the value added by shareholders to the capital they invested in an equity (Quintiliani, 2017).

$$MVA = MV \text{ (market value)} – BV \text{ (book value)} \quad (2)$$

If MV/BV ratio exceeds one, it means that a company has intellectual capital resources. In the case of Grupa Żywiec S.A., this ratio is at an exceptionally good level, and its fluctuations need to be monitored and related to other indices (e.g. the number of employees, investment values, etc.). If the ratio is below one, this can mean: a lack of intellectual capital or turbulence with regard to the valuation of market value carried out by shareholders or rating agencies. This index is often criticised for being too superficial in its approach to valuation and for great impact of speculation on actual share valuation, which – and it is worth emphasising – is

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[3]*Price of shares determined for 2019 as of 30th December 2019, price for 2018 – as of 28th December 2018, price for 2017 – as of 29th December 2017 and price for 2016 – as of 30th December 2016 based on (BRa, 2020).*

done on an ongoing basis, when the remaining balance sheet values are determined ex post. It also does not provide a specific value, although – in a sense – after being supplemented with MVA, it enables us to determine that value, but it only indicates that intangible assets characterised by intellectual capital have been disclosed in a company's resources. MVA value in relation to the number of employees indicates the same variable tendency as in the case of MV/BV. However, if we compare this data with another index applied in the Skandia Navigator (Edvinsson, 1997) and in the Intangible Assets Monitor (Sveiby, 1997), i.e., profit per one employee, it turns out that 2018 was the best year with regard to profitability per human capital (Table 3).

Table 2. *MVA per one employee of Grupa Żywiec S.A., between 2016 and 2019 (in PLN thousand)*

Grupa Żywiec S.A.	2016	2017	2018	2019
MVA	3,635,088.29	3,961,717.06	3,847,548.69	4,127,167.13
number of employees (as per 31st December)	1991	1952	1949	2262
MVA/per 1 employee	**1,825.76**	**2,029.57**	**1,974.11**	**1,824.57**

Source: *Authors' own elaboration based on data from (GKZ, 2020; BRa, 2020)*

Table 3. *Profit index per one employee of Grupa Żywiec S.A., between 2016 and 2019 (in PLN thousand)*

Grupa Żywiec S.A.	2016	2017	2018	2019
net profit	272,573	258,550	324,096	330,335
number of employees (as per 31st December)	1991	1952	1949	2262
profit per 1 employee	**136.90**	**132.45**	**166.29**	**146.04**

Source: *Authors' own elaboration based on data from (GKZ, 2020; BRa, 2020)*

Provided the employment is stable, this interpretation of the index provides specific information about the financial condition of Grupa Żywiec S.A., and when supplemented with an ownership equity increase in 2018 by 107% (from PLN 149,498 thousand to PLN 309,735 thousand) and in 2019 a decrease by 39% (to PLN 187,604 thousand), it indicates a very good situation within the context of financial and non-financial data, in which the enterprise has followed the investment and development trend.

3.2 Calculated Intangible Value Index

The calculated intangible value index belongs to methods based on return on assets. The basic assumption undertaken the CIV method says that an investment in physical capital can only yield the average return prevailing in the industry. So,

anything that exceeds the average yield is explained by the application of intellectual capital. According to Stewart (1977), the portion of a company's profits exceeding average profits in that company's sector, comes from intellectual capital (Aho, Ståhle, Ståhle, 2011). Table 4 presents CIV calculation for Grupa Żywiec S.A. Initially, the method was developed *"for tax reasons when determining the market value of a company's intangible assets"* (Kasiewicz *et al.,* 2006). Again, it was proposed by Stewart (1977) as a method of valuing intellectual capital, and involves seven steps within the intangible assets' valuation process (Aho *et al.,* 2011; Nita, 2013; Strojny, 2003):

1. Calculating the average gross profit for the past three or five years of business activity.
2. Estimating the average value of tangible assets for the same period based on the balance sheet.
3. Calculating the average return on assets (ROA) as a quotient of the values obtained in the previous steps (dividing the average profit from the past three or five years by the average value of tangible assets).
4. Determining the average return on assets (ROA) for the industry in which the company is active for the same period (past three or five years).
5. Calculating excess return by multiplying the industry average ROA by the average tangible assets of the company and subtracting it from the gross profit (multiplying the average ROA index for the whole industry by the average tangible assets of the company and then subtracting the obtained value from average pre-tax profit).
6. Calculating the average corporate tax rate from the past three or five years and then multiplying the obtained value by the excess return calculated in step five, subtracting the result from the excess amount; the obtained amount constitutes a premium attributable to intangible assets, known as intellectual premium (subtracting the product of the average income tax rate in the analyzed period and the excess return from the excess return).
7. Estimating the present value of the premium; in order to do that, we need to divide the premium calculated in step six by an appropriate discount rate, such as the cost of capital for the company; the calculated amount corresponds to the value of intangible assets that are not included in the company's balance sheet (reduction of the excess return after taxation to the present value with the use of an appropriate rate of capital cost).

The calculated intangible assets have a positive value if the ROA rate for the company is higher than the average level for the industry, as was the case of Grupa Żywiec S.A. The discount rate should reflect the level of risk characteristic of the whole industry in which the company operates.

For the purposes of calculating intangible assets, the discount rate used was 5.59%, and was based on information provided by Financial Craft in July 2019, namely *"The capital market risk premium as a component of the discount rate was*

estimated in the update as at June 30, 2019 at 5.59 points. percent." (FC, 2020). The industry ROA was established based on profitability ratios for the food industry (BRb, 2020).

Table 4. *CIV calculation for Grupa Żywiec S.A., between 2016 and 2019 (in PLN thousand)*

Grupa Żywiec S.A.	manner of data collection	average for the years 2016-2019
gross profit	data from group accounts	4,712,820
tangible assets	data from group accounts	4,807,265
company ROA	Gross profit / tangible assets *100%	9.8%
industry ROA	market data	3.82%
excess return	Gross profit - (industry ROA Tangible assets)	4,529,182.48
tax rate	market data	19%
intellectual premium	excess return * (1 - tax rate)	3,668,637.81
discount rate	market data	4.65%
Present value of intellectual premium	**intellectual premium / discount rate**	**65,628,583.30**

Source: *Authors' own elaboration based on data from (GKZ, 2020; BRa, 2020; FC, 2019; BRb, 2020)*

The value of intangible assets of Grupa Żywiec S.A. estimated with the use of the CIV method is PLN 65,628,583.30 (in thousand). The MV in 2019 was PLN 5,032,955.13 (in thousand), which means that the present value of intellectual premium exceeds the market value by PLN 60,595,628,17 (in thousand). In practice, this means that the company is doing excellently when it comes to using its intangible assets and has a significant – yet so far underestimated by the market – intellectual capital. We need to remember, however, that CIV is based on estimated values (discount rate, ROA), which regrettably favours over- or underestimation of real values.

3.3 Tobin's Q Ratio

With its 50-year history, Tobin's q ratio still constitutes a popular tool for *"making investment decisions independently of microeconomic factors"* (Kasiewicz *et al.,* 2006) and is extensively used in the financial literature as a proxy for future investment opportunities. Tobin proposed a coefficient belonging to a group of methods based on market capitalisation, which compares the market value of an asset with its replacement value. If q is lower than 1, it is not likely that the company will buy more of this type of assets. If the asset were worth more than the replacement cost, the company would invest in a similar asset. This is a cost-based approach (Ortiz, 2011). Table 5 presents values of Tobin's q ratio for Grupa Żywiec

S.A. Constituting a ratio of market value of a company to the replacement value of its assets, Tobin's q ratio is expressed as follows:

$$\text{Tobin's q} = \text{Gross market value} / \text{Cost of tangible asset replacement} \qquad (3)$$

Gross market value is calculated as follows:

$$\text{Gross market value} = \text{market value of ordinary shares} + \text{book value of} \qquad (4)$$
$$\text{preference shares} + \text{market value of long-term liabilities} + \text{book value of}$$
$$\text{inventory} + \text{book value of short-term liabilities} - \text{book value of current assets}$$

Table 5. *Tobin's q ratio for Grupa Żywiec S.A. between 2016 and 2019 (in PLN thousand)*

Grupa Żywiec S.A.	2016	2017	2018	2019
market value of a share	4,550,202.29	4,848,071.06	4,745,357.69	5,032,955.13
long-term liabilities	604,890	557,678	25,568	1,100,729
inventory	95,900	94,933	100,289	115,379
short-term liabilities	1,085,378	1,136,689	1,521,448	1,191,202
current assets	782,472	799,219	786,305	884,205
total market value of a given company	5,553,898.29	5,838,152.06	5,606,357.69	6,566,606.13
assets	1,879,315	1,843,865	1,856,751	2,479,535
Tobin's q ratio	**2.96**	**3.17**	**3.02**	**2.64**

Source: *Authors' own elaboration based on data from (GKZ, 2020; BRa, 2020)*

The value of Tobin's q ratio is determined as positive or negative depending on whether its value is higher or lower than 1. In the case of companies with high capital intensity, the value of that ratio may be lower or close to 1 without expressing the actual value of intellectual capital. It is therefore worth comparing with competitive entities and entities from similar lines of business. The numerator of the Tobin's q ratio is the market value of the firm and it depends on discounted expected future cash flows that is generated by the enterprise assets. Since the denominator of the ratio is simply the replacement cost of assets it is expressed in present value terms, creating an implied positive association between a firm's Tobin's q ratio and its future cash flows (Fu *et al.,* 2016).

The level of Tobin's q ratio for Grupa Żywiec S.A. has a positive value and fluctuates around 3, indicating a very good level of intellectual capital, which in a broader perspective means that the company has intangible assets that encourage increasing its value and capability of using its competitive potential. The decrease in the ratio in 2019 is related to the increase in long-term liabilities resulting from the company's investment strategies. Similarly, to MV/BV, Tobin's q ratio is an

excellent auxiliary index that monitors the state of intellectual capital and supports analysis of a company's current situation.

The ratio also has its weak points, which correspond with those of MV/BV indicated above. In the case of Tobin's q ratio, the most serious drawback with regard to the accuracy and reliability of the obtained results concerns the determination of the replacement value of assets, because such task is more difficult to complete than indicating a book value. Even in the most thorough analyses, the correctness of determining the replacement value of a given asset is a function of the availability of data concerning the asset market, which makes it at least partly subjectively conditioned (Nita, 2013).

In the case of a long-term downward trend for MV/BV and Tobin's q ratios, we have a decrease in the value of a company's intangible assets. This is an important call for taking corrective actions aimed at preventing ineffective intellectual capital management.

3.4 Value Added Intellectual Coefficient

Pulic (2000), the author of the value-added intellectual coefficient method - VAIC™, pointed out the need to present a company's capabilities with regard to creating added value based on structural elements of intellectual capital. *"The basic premise of the model boils down to a statement that intellectual added value of a company constitutes a sum of coefficients describing the efficiency of three components of its market value, i.e. financial, human and structural capital"* (Nita, 2013). The value-added intellectual coefficient is expressed as follows:

$$\text{VAIC}^{\text{TM}} = \text{CEE} + \text{HCE} + \text{SCE} \qquad (5)$$

where:
VAIC™ – value added intellectual coefficient,
CEE – capital employed efficiency
HCE – human capital efficiency,
SCE – structural capital efficiency.

Table 6 presents VAIC™ calculation for Grupa Żywiec S.A. along with a description of specific VAIC™ components and the manner of data collection. In order to calculate VAIC™ properly, we need to proceed step by step, similarly to the CIV calculation. Based on the characteristics of the coefficient presented in the literature review (Iazzolino and Laise, 2013; Ståhle, Ståhle and Aho, 2011), these steps are as follows:

1. Obtaining income data (IN) and expense data (OUT), excluding the costs of human capital, capital employed (CE), human capital (HC).

2. Calculating value added (difference between income and expense VA=IN - OUT).
3. Calculating the company's capital employed efficiency (quotient of value added divided by capital employed CEE=VA/CE).
4. Calculating the company's human capital efficiency (quotient of value added divided by human capital HCE=VA/HC).
5. Calculating structural capital (value added - human capital SC=VA - HC).
6. Calculating the company's structural capital efficiency (quotient of structural capital divided by value added SCE=SC/VA).
7. Calculating the value-added intellectual coefficient (sum of capital employed efficiency, human capital efficiency and structural capital efficiency, VAIC™=CEE+HCE+SCE).

The value-added intellectual coefficient method is an example of combining the existing solutions proposed within the concept of intellectual capital management with a reliable economic approach, which, in its index form, provides a summary of incurred expenditures and obtained results. The advantage of this index is that it considers both tangible and intangible assets for the purpose of determining the efficiency of creating added value and that its approach is based on data that is available in all companies regardless of their legal form. Observation of a VAIC™ trend allows us to monitor the efficiency of using intellectual capital resources in a company, and its upward trend indicates an increase in the effectiveness of using all resources. The method is focused on obtaining knowledge about whether and to what extent a company uses its own resources when creating value, and how this usage is divided into specific categories of capital, however it does not provide information about the valuation of intellectual capital itself.

In the case of Grupa Żywiec S.A., the VAIC™ trend in years 2016-2017 was particularly good, and in 2018 it was over 25% decrease YoY, which was caused by a change in the employed capital. Year 2019 already has an upward trend, despite a further increase in employment. The indices for human and structural capital are stable. In correlation with CIV, it may be surmised that the company, while having an extremely high intellectual premium, is effective at managing tangible and intangible assets in the course of creating intellectual added value.

Table 6. *VAIC™ calculation for Grupa Żywiec S.A., between 2016 and 2019 (in PLN thousand)*

Grupa Żywiec S.A.		manner of data collection	2016	2017	2018	2019
IN	income	data from group accounts	2.392.605	3,165,262	3,323,753	3,199,242
OUT	expense (excluding costs of human capital)	data from group accounts	868,070	1,755,549	1,845,491	1,863,984

VA	value added	income - expense (excluding costs of human capital)	1,524,535	1,409,713	1,478,262	1,335,258
CE	capital employed	data from group accounts	189,047	149,498	309,735	187,604
CEE	**capital employed efficiency**	**value added/capital employed**	*8.06*	*9.43*	*4.77*	*7.12*
HC	human capital	data from group accounts	291,014	294,165	267,209	182,560
HCE	**human capital efficiency**	**value added/human capital**	**5.24**	**4.79**	**5.53**	**7.31**
SC	structural capital	value added - human capital	1,233,521	1,115,548	1,211,053	1,152,698
SCE	**structural capital efficiency**	**structural capital/ value added**	**1.24**	**1.26**	**1.22**	**1.16**
VAIC™ value added intellectual coefficient		**CEE+HCE+SCE**	**14.54**	**15.49**	**11.53**	**11.59**

Source: *Authors' own elaboration based on data from (GKZ, 2020; BRa, 2020)*

4. Conclusions

The knowledge of intellectual capital and its diversity constitutes a key condition for the efficiency of decision-making processes as well as the creation of action strategies to be adopted by the management through development of intangible assets. Over the past few years, the ability to carry out intangible asset valuation has become one of the key pillars of total corporate value management processes.

The example of valuing intellectual capital of brewing industry, using financial and non-financial data of the Grupa Żywiec S.A., indicates firstly that in must be a long-term process enabling comparative data analysis. A comprehensive presentation of intellectual capital and its thorough analysis are possible only when based on data from subsequent years that enables monitoring and determining trends or spatial and temporal comparison.

Secondly, the valuation needs to be carried out with the application of various methods, as these enable structural comparison and referring to different criteria. Only by comparing the results we are able to take a synthetic approach towards the obtained values that constitute evaluation of the owned intellectual capital resources. Further development of intellectual capital valuation methods should be focused on reflecting the context in order to accurately project the conditions in which companies operate.

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