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Intellectual capital and company value

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Abstract

The bulk of traditional corporate valuation methods reflect historical performance, while it is necessary to also take into consideration the value which is off-balance-sheet and possible growth. Large differences exist between company market and book value, and a part of this can be explained by intellectual capital. The aim of the study is to make an empirical investigation of the impact of intellectual capital on company value. Empirical results show that one can find mixed results regarding relationship between value added intellectual coefficient VAIC[TM] and company value.

1. Introduction

One of the main objectives of a company manager is to maximize company value. Company value is at the center of corporate finance, however, calculating a value for a company is not easy. First, different companies should be valued differently (for example, public company vs. private company). Second, company value depends on the aim of the valuation as well (one company can have several values, depending on the method). The last two decades have seen a stream of innovation in financial markets, yet corporate valuation methods have not changed significantly. Traditional corporate valuation methods include discounted cash flow valuation, liquidation and accounting valuation, relative valuation and contingent claim valuation (different authors propose various groupings

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of valuation methods). The bulk of these methods reflect historical performance, while it is necessary to also take into consideration the value which is off-balance-sheet and possible growth.

Traditional corporate valuation methods are based on balance sheet, income statement or cash flow statement; however, intellectual capital is an asset as well. Yet it is valued at zero on the balance sheet. Large differences exist between company market and book value, and a part of this can be explained by intellectual capital. Even though there is no universal definition of intellectual capital, its information provides an indication about the future potential of a company.

The aim of the study is to make an empirical investigation of the impact of intellectual capital on company value. The tasks of the research are as follows: to analyze the significance of intellectual capital and review the results of previous research on VAIC^{TM}; to evaluate the relationship between VAIC^{TM}, its components and company value; to make conclusions and work out recommendations for improvement of traditional corporate valuation methods.

The analysis is conducted on a sample of 64 Baltic listed companies (Baltic Stock Exchange) over the period from 2005 to 2011. In the research paper, the following qualitative and quantitative methods of research are applied: the monographic method, descriptive statistics and correlation analysis. The research is based on published papers on intellectual capital and VAIC^{TM}, as well as the information provided by the Baltic Stock Exchange.

The remainder of the paper is organized as follows. Section 2 describes the intellectual capital and recent empirical findings on this subject; Section 3 illustrates the sample and methodology of research; Section 4 contains the analysis carried out and the discussion. The final section concludes the paper.

2. Intellectual capital

There are many corporate valuation methods. Nevertheless, studies find contradictory results, and the corporate finance community is not even close to a universal methodology of company valuation. Different methods have different advantages in different situations, and some capture important aspects of valuing a business, which are not recognized by others. Traditional company valuation methods pay more attention to either historical figures (based on the balance sheet, income or cash flow statement) or inexact forecasting [for example, free cash flow and weighted average cost of capital (WACC) for subsequent periods]. These methods are mostly taking into consideration the physical assets of the company, while in the knowledge-based economy more emphasis is put on employees and intellectual capital. Therefore, afore mentioned corporate valuation methods are not suitable in today's world.

In a knowledge-based economy, one must take into consideration not only the traditional ways to measure the company value, but it is necessary to recognize intellectual capital as well. Traditional measures of a company's performance, which are based on conventional accounting principles, may be unsuitable in the knowledge–based economy which is driven by intellectual capital (Gan & Saleh, 2008). Although intellectual capital and knowledge assets are difficult to discern and quantify, their results will nonetheless be reflected in the company's greater productivity, efficiency, and overall profitability. The limitations of financial statements in explaining company value underline the fact that the source of economic value is no longer the production of material goods, but the creation of intellectual capital (Chen, Cheng & Yuchang, 2005).

Intellectual capital is intangible and cannot be accurately measured. For example, Frykman & Tolleryd (2010) define intellectual capital as all non-financial assets of a company that are not reflected in the balance sheet. Yet Tawy & Tollington (2012) have observed that there is no universal definition for intellectual capital and the cause and effect relationship between intellectual capital and value creation is, at best, indirect.

Bayburina & Golovko (2009) emphasized that intellectual capital is the "intangible safety - cushion", which can be used only by companies who have created it years before. Therefore it is necessary to focus on sustainable development. The panel data analysis of before mentioned study revealed that the human capital can be considered the key factor of the long-term growth of BRIC companies. Brown *et al.* (2005) emphasize that intellectual capital has ascertainable monetary value, provides a company with a competitive edge, and enables it to differentiate itself from tis competitors.

Value Added Intellectual Coefficient (VAIC^{TM}) is a method developed by Pulic (2000), which monitors and measures the value creation efficiency in the company according to accounting based figures. The VAIC^{TM} model is intended to measure the extent to which a company produces added value based on intellectual (capital) efficiency or intellectual resources (Stahle, Stahle & Aho, 2011):

- Human capital (HC) is interpreted as employee expenses and human capital efficiency (HCE) is calculated by dividing VA (added value) with HC (human capital);
- Structural capital (SC) is difference between produced added value (VA) and human capital (HC). Structural capital efficiency (SCE) is calculated by dividing SC (structural capital) with VA (value added);
- Capital employed (CE) is interpreted as financial capital and capital employed efficiency (CEE) is calculated by dividing VA (value added) with CE (capital employed).
- Value added intellectual coefficient VAIC^{TM} is a sum of HCE, SCE and CEE.

As summarized by Boujelbene & Affes (2013), human capital captures the knowledge, professional skills, experience and innovativeness of employees within an organization, whereas structural capital consists of the structures and processes employees develop and deploy in order to be productive, effective and innovative.

VAIC^{TM} measures how much new value has been created per invested monetary unit of resources. A high coefficient indicates a higher value creation using company resources. Capital employed efficiency (CEE) shows how much new value has been created by one unit of investment in the capital employed. Human capital efficiency (HCE) indicates how much value added has been created by one financial unit invested in the employees. Structural capital efficiency (SCE) is the indicator of the value added efficiency of structural capital (Gan & Saleh, 2008).

VAIC^{TM} is an easy-to-calculate, standardized, and consistent basis of measure, enabling effective comparative analyses across companies and countries (Firer & Williams, 2003). On the other hand, the analysis by Stahle, Stahle, & Aho (2011) shows that VAIC^{TM} parameters have nothing to do with intellectual capital; they merely indicate the efficiency of the company's labor and capital investments.

Many papers are published on intellectual capital or VAIC^{TM} and company performance. The results by Chen, Cheng, & Yuchang (2005) provide empirical evidence that investors place higher value on companies with better intellectual capital efficiency, and that company with better intellectual efficiency gains greater profitability and revenue growth in both the current and the following years. Shiu (2006) found that VAIC^{TM} has a positive correlation with profitability (return on assets) and market valuation (market-to-book ratio), while a negative correlation with productivity was found. The study by Wang (2008) found that Tobin's Q, KCE (Knowledge Capital Earnings), and VAIC^{TM} have a positive relationship with company value. Maditinos (2011) found a significant relationship between human capital efficiency and the return on equity. Rahman (2012) used a sample of 100 UK firms listed on the London Stock Exchange and confirmed that greater intellectual capital efficiency leads to a better financial performance. The empirical analysis by Pucci, Simoni, & Zanni (2013) shows that there is a positive direct relationship between company's intellectual capital value and performance. Chang (2013) found that intellectual capital components generally have a positive direct/indirect effects on financial performance. Findings by Lu, Wang & Kweh (2014) reveal that intellectual capital is significantly and positively associated with company's operating efficiency. The results obtained by Wang (2013) show a positive relationship between Tobin's Q and VAIC^{TM}.

The findings by Sumedrea (2013) show that in crisis the development of companies is influenced by the human and the structural capital. Several papers focus on intellectual capital and profitability. Study by Sydler, Haefliger & Pruksa (2013) concluded that an increase in intellectual capital is associated with a higher return on assets over time. Daryaee *et al.* (2011) stated that corporate value (in this case used Tobin's Q) is positively correlated with intellectual capital, however not found any relation between return on assets and intellectual capital.

Yet other studies did not find any significant relationships. For example, Ferraro & Veltri (2011) concluded that the intellectual capital variables do not have a meaningful relation with the market value. Analysis by Mehralian, Rasekh, Akhavan & Sadeh (2012) also failed to support the impact of intellectual capital on market value. Results by Tanideh (2013) indicate that there is no significant relationship between intellectual capital and corporate value.

Some studies found no relationship between intellectual capital, VAIC^{TM} and company performance, yet components of VAIC^{TM} show different results (Chu, Chan, Yu, Ng & Wong, 2010; Gan & Saleh, 2008; Clarke, Seng, & Whiting, 2011). For example, Huang & Hsueh (2007) concluded that structural capital and relational capital have better performance, whereas human capital presents the poorest performance.

Research has been done in the Baltic countries as well. For example, Stankeviciene & Liucvaitiene (2012) stated that the result of intellectual capital evaluation is conditioned by the size of the company, its activity, and view of the managers themselves on the demand for measuring the intellectual capital.

As pointed out by Iazzolino & Laise (2012), the performance measure proposed by Pulic (VAIC^{TM}) is not a genuine rival of traditional methodologies. In addition, VAIC and EVA measure different aspects of the

performance and, therefore, may usefully live together in a context in which the performance is measured through multicriteria methodologies.

Alcaniz, Gomez-Bezares, & Roslender (2011) state that it is unlikely that accounting, as it has traditionally been understood, is capable of meeting new challenges of intellectual capital. At the very least, it seems desirable to continue to promote combinations of numbers in order to take into account the intellectual capital. Similar conclusions are made by Gowthorpe (2009) – intellectual capital accounting does not fit successfully into the traditional model of financial accounting and reporting. The results of study by Cronje & Moolman (2013) also indicate that accounting should be modified to ensure a standardized and comparable approach on intellectual capital.

Undeniable is the fact that intellectual capital is an asset of the company and an increase in intellectual capital should increase the value of the company as well. Yet empirical results of intellectual capital and VAIC^{TM} are inconsistent. Some studies find positive correlation between intellectual capital and company value, while others do not find any relationship. In addition, there is a bulk of studies, which find a connection between VAIC^{TM} components and market value. Certainly, the subject of intellectual capital and its impact on value is topical and more research is necessary.

3. Sample and research methodology

The study is based on financial data collected from the financial statements of 64 Baltic listed companies *(Table 1)*. The financial and real estate companies are excluded from the study due to their distinct balance sheet structure. The analysis is based on seven years of data (2005–2011) for Estonia, Latvia and Lithuania. The selection criteria required all companies to have all variables available for all seven years analyzed. Companies that failed to meet this requirement were excluded from the sample.

Table 1. Number of Baltic listed companies used in the study, 2005–2011

	Latvia	Estonia	Lithuania
Main list	5	11	12
Secondary list	24	0	12

This study uses a sample which consists of several sectors of industry. The highest number of companies in one sector can be found for consumer goods (24), whereas other industries are utilities, telecommunication, technology, industrials, health care, consumer service and basic materials companies (*Table 2*).

Table 2. Number of Baltic listed companies used in the study by industries, 2005–2011

Industry	Number of companies
Basic materials	5
Consumer goods	24
Consumer services	7
Health care	5
Industrials	17
Technology	1
Telecommunications	1
Utilities	4

The analysis is conducted using the correlation method. The Pearson correlation ratio measures the degree and the direction of linear relationship between two variables. Correlation coefficient of +1 corresponds to a perfect positive linear relationship, coefficient of –1 corresponds to a perfect negative linear relationship, and 0 indicates no linear relationship between variables.

As a proxy for company value, the Tobin's Q was used, which was introduced by James Tobin (1969). There are several methodologies and formulas used in the calculation of Tobin's Q (for example, see Wernerfelt &

Montgomery, 1998; Linderberg & Ross, 1981; Chung & Pruitt, 1994). This study used the methodology by Jin & Jorion (2006). This methodology was used, for example, by Gomez-Gonzales, Rincon, & Rodriguez (2012).

$$Tobin's \ q \ = \frac{BV \ total \ assets - BV \ common \ equity + MV \ common \ equity}{BV \ total \ assets} \qquad (1)$$

where BV is book value and MV is market value.

If Tobin's Q is greater than 1, then the market value is greater than the book value of company assets; the market may be overvaluing the company. On the other hand, if Tobin's Q less than 1, then the market value is less than the book value of the assets; the market may be undervaluing the company. Tobin's Q is used by Coad & Rao (2006); Sorescu (2008); Dotzel, Shankar, & Berry (2013); Wang (2013), Kweh, Chan, & Ting (2013).

Value Added Intellectual Coefficient (VAIC[TM]) consists of a sum of human capital efficiency (HCE), structural capital efficiency (SCE) and capital employed efficiency (CEE):

Human capital efficiency (HCE) = value added (VA) / human capital (HC) (2)

Structural capital efficiency (SCE) = structural capital (SC) / value added (VA) (3)

Capital employed efficiency (CEE) = value added (VA) / capital employed (CE) (4)

Value added intellectual coefficient (VAIC[TM]) = HCE + SCE + CEE (5)

This study uses the approach by A.Riahi-Belkaoui (2003), when value added (VA) is calculated:

VA = W + I + DD + T + R, (6)

where W is wages, I – interest, DD – dividends, T – taxes and R – net income.

VAIC[TM] is widely used in analysis of intellectual capital, see for example, Pastuszak, Chuacharoen, Tong-In, Anussornnitisarn, Meeanpol, & Shuy (2013); Fourati & Affes (2013); Joshi, Cahill, Sidhu, & Kansal (2013); Kweh, Chan, & Ting (2013); Darabi, Kamran, & Ghadiri (2012); Venugopal & Subha (2012); Pucar (2012); Rahman (2012); Komnenic & Pokrajcic (2012).

4. Empirical analysis and discussion of results

Table 3 represents the average Tobin's Q, CEE, HCE, SCE and VAIC for each year of the research in Latvian, Lithuanian and Estonian companies. As shown in the table, Tobin's Q of Estonian companies exceeded 1 in all years [the highest value was achieved in 2007 (2.26)]. A different situation can be found for Latvian companies. The Tobin's Q has only once exceeded 1 (in 2007). Overall, these results indicate that the market might be overvaluing the companies in Estonia, while undervaluing the companies in Latvia, whereas Tobin's Q in Lithuania was around 1.

A VAIC[TM] of 2.58 was obtained in the case of Latvia for the year 2011. This indicates that the company created 2.58 LVL out of one LVL invested in the company. If the components are examined individually, then one can conclude that human capital is more efficient in creating value for the company in comparison to capital.

All value added intellectual coefficients exceed 1 and it means that an average company has created more than 1 monetary unit out of every monetary unit invested in the company. The highest return was achieved in 2006 for companies in Estonia (4.84). One can note that companies in Estonia had both the highest VAIC[TM] and Tobin's Q results for the period analyzed. This can indicate that a higher level of intellectual capital can be associated with increased company value.

Table 4 provides the Pearson correlation matrix of the variables included in the study:

- VAIC[TM] is positively correlated with CEE, HCE and SCE, which was as expected since VAIC[TM] is calculated as the sum of CEE, HCE and SCE;
- In the case of Estonia, there is no significant correlation between VAIC[TM], its components and company value;
- In the case of Lithuania and Latvia, a positive correlation can be found between CEE, HCE, VAIC[TM] and company value.

Table 3. Average indicators for companies of Baltic countries, 2005–2011

	2005	2006	2007	2008	2009	2010	2011
Latvia							
Tobin's Q	0.72	0.67	1.03	0.76	0.58	0.66	0.71
CEE	0.39	0.43	0.41	0.34	0.33	0.42	0.33
HCE	2.43	2.39	2.35	1.75	1.69	1.76	1.77
SCE	0.63	0.44	0.59	0.33	0.76	0.85	0.48
VAIC^{TM}	3.46	3.26	3.35	2.42	2.78	3.02	2.58
Lithuania							
Tobin's Q	1.48	1.20	1.61	1.27	0.90	1.11	0.80
CEE	0.31	0.26	0.41	0.36	0.30	0.41	0.48
HCE	1.58	1.13	1.21	0.85	0.74	0.84	1.00
SCE	0.59	0.56	0.05	0.46	0.69	0.63	0.95
VAIC^{TM}	2.48	1.95	1.67	1.78	1.89	1.94	2.33
Estonia							
Tobin's Q	1.49	1.38	2.26	1.62	1.07	1.36	1.59
CEE	0.33	0.59	0.58	0.34	0.16	0.32	0.53
HCE	1.69	3.44	3.34	2.93	2.02	3.00	3.00
SCE	0.76	0.80	0.73	0.56	2.24	1.27	0.83
VAIC^{TM}	2.78	4.84	4.65	3.82	4.43	4.59	4.37

To sum up, company value increases slightly with an increase in the value added intellectual coefficient, capital employed efficiency (CEE) and human capital efficiency (HCE) in Latvia and Lithuania, whereas this statement is not applicable in Estonia.

In addition, the Pearson correlation matrix was prepared for two separate years – 2005 and 2010. These years were selected by taking into consideration the economic situation in the Baltic countries. Year 2005 can be characterized by high GDP growth and low unemployment, while for year 2010, the opposite is true. Correlation results of year 2005 and 2010 are included in Table 5. Several differences can be stated:

- In 2005, only correlation between CEE and Tobin's Q is statistically significant and shows a medium strong relationship (correlation coefficient of 0.45);
- In 2010, an increase in Tobin's Q is associated with an increase in CEE (correlation coefficient of 0.424), HCE (coefficient of 0.281) and VAIC^{TM} (coefficient of 0.255);
- The relationship between company value and VAIC^{TM} is stronger in 2010 (correlation coefficient is higher and statistically significant as well).

To sum up, one can find a statistically significant and positive relationship between VAIC^{TM} and company value in Latvia and Lithuania (if one compares countries) and in year 2010 (if one compares years). In addition, there are significant correlations between company value, human capital efficiency and capital employed efficiency. Overall, however, mixed results were obtained, if one takes into consideration the results for companies in Estonia and in year 2005 (upward phase of economic development). Different results between countries could be explained with diverse capital structure (Berzkalne, 2013). Estonian companies had the highest long-term debt ratio, if compared to Latvia and Lithuania. Consequently, while Estonian companies had the highest total debt ratio, it mostly consisted of the (cheaper) long-term debt, which might have led to the highest company value (Tobin's Q ratio) and VAIC^{TM}. However, different results regarding correlation analysis are puzzling, therefore further research is required.

Table 4. Pearson correlation matrix for Baltic listed companies, 2005–2011

Country		Tobin's Q	CEE	HCE	SCE	VAIC
Estonia	Tobin's Q	1	0.224 (0.052)	0.183 (0.114)	-0.069 (0.552)	0.151 (0.193)
	CEE	0.224 (0.052)	1	0.358** (0.001)	-0.130 (0.261)	0.369** (0.001)
	HCE	0.183 (0.114)	0.358** (0.001)	1	-0.113 (0.328)	0.859** (0.000)
	SCE	-0.069 (0.552)	-0.130 (0.261)	-0.113 (0.328)	1	0.399** (0.000)
	VAIC	0.151 (0.193)	0.369** (0.001)	0.859** (0.000)	0.399** (0.000)	1
Latvia	Tobin's Q	1	0.356** (0.000)	0.201** (0.004)	-0.041 (0.564)	0.216** (0.002)
	CEE	0.356** (0.000)	1	0.721** (0.000)	-0.040 (0.571)	0.761** (0.000)
	HCE	0.201** (0.004)	0.721** (0.000)	1	-0.068 (0.332)	0.926** (0.000)
	SCE	-0.041 (0.564)	-0.040 (0.571)	-0.068 (0.332)	1	0.291** (0.000)
	VAIC	0.216** (0.002)	0.761** (0.000)	0.926** (0.000)	0.291** (0.000)	1
Lithuania	Tobin's Q	1	0.289** (0.000)	0.254** (0.001)	0.032 (0.692)	0.236** (0.003)
	CEE	0.289** (0.000)	1	0.364** (0.000)	0.033 (0.681)	0.445** (0.000)
	HCE	0.254** (0.001)	0.364** (0.000)	1	-0.054 (0.497)	0.687** (0.000)
	SCE	0.032 (0.692)	0.033 (0.681)	-0.054 (0.497)	1	0.655** (0.000)
	VAIC	0.236** (0.003)	0.445* (0.000)	0.687** (0.000)	0.655** (0.000)	1

**Correlation is significant at the 0.01 level (2-tailed), *Correlation is significant at the 0.05 level (2-tailed).

Table 5. Pearson correlation matrix for Baltic listed companies, 2005 and 2010

Year		Tobin's Q	CEE	HCE	SCE	VAIC
2005	Tobin's Q	1	0.445** (0.000)	0.155 (0.221)	-0.170 (0.180)	0.158 (0.213)
	CEE	0.445** (0.000)	1	0.470** (0.000)	0.053 (0.680)	0.578** (0.000)
	HCE	0.155 (0.221)	0.470** (0.000)	1	-0.012 (0.925)	0.953** (0.000)
	SCE	-0.170 (0.180)	0.053 (0.680)	-0.012 (0.925)	1	0.262* (0.037)
	VAIC	0.158 (0.213)	0.578** (0.000)	0.953** (0.000)	0.262* (0.037)	1
2010	Tobin's Q	1	0.424** (0.000)	0.281* (0.024)	-0.133 (0.297)	0.255* (0.044)
	CEE	0.424** (0.000)	1	0.530** (0.000)	-0.099 (0.439)	0.576** (0.000)
	HCE	0.281* (0.024)	0.530** (0.000)	1	-0.125 (0.329)	0.891** (0.000)
	SCE	-0.133 (0.297)	-0.099 (0.439)	-0.125 (0.329)	1	0.317* (0.011)
	VAIC	0.255* (0.044)	0.576** (0.000)	0.891** (0.000)	0.317* (0.011)	1

**Correlation is significant at the 0.01 level (2-tailed), *Correlation is significant at the 0.05 level (2-tailed).

Overall, the authors of this paper recommend combining the traditional company valuation methods with VAIC[TM] or its components in order to achieve better company valuation. The advantages of the combined model would be as follows: the valuation model should include not only historical information, but should recognize the significance of intellectual capital as well; the model should be able to explain the difference between company's

market value and its book value. This model would be applicable to companies in Latvia and Lithuania, but not in Estonia.

Existing accounting system is unable to show intellectual capital in reports, and the methodology of value added intellectual coefficient is essentially based on historical information (taken from historical annual reports). Since human capital efficiency and capital employed efficiency have the highest results (average indicators in Table 1 and correlation coefficients with VAIC in Table 2 and Table 3), it can be recommended that new and improved intellectual capital methodology is based on these indicators. Other component – structural capital efficiency – show low values and correlation with company value is low as well.

It is necessary to develop a new framework to identify, classify and calculate the value of intellectual capital. In addition, the new methodology should be able to better explain the difference between company's book and market value than the existing methodologies. The authors recommend that one component should be linked to intangible assets of the company. For example, SFAS (Statement of Financial Accounting Standards) No. 142 (2001) classifies intangible assets as: R&D costs, software development, patents and copyrights, brands and trademarks, as well as goodwill value. Some part of intangible assets can be associated with intellectual capital, therefore it can be used on some level to develop new measures of intellectual capital, which in turn can help explain the difference in book and market value of the company more efficiently.

5. Conclusions and recommendations

The research covered 65 Baltic listed companies over the period from 2005 to 2011. The study used correlation analysis to provide an empirical investigation of the impact of intellectual capital on company value. As a proxy for company value, the Tobin's Q was used, and as a proxy for intellectual capital, the value added intellectual coefficient (VAIC^{TM}) was employed.

The study finds that an increase in intellectual capital should increase the value of the company. Yet empirical results by other authors are inconsistent, and this study obtained mixed results as well. There is a statistically significant and positive relationship between intellectual capital and company value for enterprises in Latvia and Lithuania, whereas such correlation was not observed for companies in Estonia.

It is recommended to combine the traditional company valuation methods with the value added intellectual coefficient or its components in order to achieve better company valuation. In addition, for further valuation improvement, it is necessary to review and modify how the value of intellectual capital is calculated. The results of this research show that human capital efficiency and capital employed efficiency can be still used in order to calculate the intellectual capital, however structural capital efficiency is not significant in the case of intellectual capital and company value.

Since in this study included Baltic listed companies, which represent different industries, the future research should consider industry-based analysis as well.

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