Intellectual Capital Evaluation: Relationship between Knowledge Management Implementation and Company's Performance

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Abstract

Knowledge management is becoming the most relevant and challenging issue of company's strategy implementation in new economy. One of the most important issues in knowledge management is intellectual capital identification and evaluation.. Our study focuses on the evaluating intellectual capital methods which allow finding out the most efficient way of intellectual capital management, including investment decision making. We suppose that the potential effectiveness of intellectual capital resources varies depending on the company size, industry and country.

Most of the relevant researches are based on resource- and value-based approaches which separately analyze the intellectual capital from a certain point of view, limiting the number of problems at the intersection of these concepts. Therefore, we integrate two approaches to solve problems of intellectual capital evaluation which are relevant for firms and industries behavior studying.

We seek to integrate two approaches to answer following questions:

- Is there a close relationship between an intellectual capital quality and company performance: a creation and destruction of the enterprise value due to intellectual capital employed?
- What are the external and internal factors affecting on this relationship? (country, industry, firm size, market dynamics, etc.)
- Is there a certain complementarity of the intellectual capital separate components (human, institutional and market resources)?

Despite a large empirical background intellectual capital management issues are not well studied fundamentally. The purpose of this research is a development of cost-effectiveness tools for a company intellectual resources analysis. Several statistical methods should be provided for the empirical issues of this research, including common cross-sectional and panel data analysis. The data base collected for this purpose will consist of financial and economic indicators underlying intellectual capital evaluation, for example, strategic performance indicators (EVA, FGV, Q-Tobin).

It should be emphasized, that a number of required data are quiet specific and hardly observed. Thus, the data base of this research founds on the annual statistical and financial reports including a description of some qualitative characteristics of analyzed companies and industries: total labor productivity, staff education level, customer loyalty, product range, R&D expenditures, participation in business associations, co-operative innovation projects, localization and specialization coefficients and others.

This paper is devoted to the research problem identification and motivation and also presents some empirical results.

Key words: intellectual capital inputs and outcomes; economic value added.

1. Introduction

The strategic role of the knowledge management for company in new economy is widely discussed both on theoretical and practical levels (Ramelt, 1991; Stewart, 2001; Roos, 2006). One of the most important issues in knowledge management is intellectual capital identification and evaluation, as well as company's performance measurement in terms of value-added of the intellectual capital.

Our study focuses on the methods of intellectual capital evaluation, in particular: key value drivers identification and their relationship analysis. This approach allows to find out the most efficient way of knowledge management, including making of investment decision. It should be emphasized that intellectual capital analysis in terms of investment evaluation is based on inputs and outcomes identification and assessment. In other words we need to study the mechanism of intellectual capital transformation in company's performance.

Most of the relevant researches are based on resource- and value-based approaches which separately analyze the intellectual capital from a certain point of view, limiting the number of problems at the intersection of these concepts. Therefore, we integrated two approaches to solve problems of intellectual capital evaluation which are relevant for firms and industries behavior studying. The idea of the intellectual capital research in the resource-based approach is associated with P. Ramelt, who showed empirically the predominance of intra-sectoral over inter- differences in the ratio of 7:1. This confirms the organizational factors dominance as a company competitive advantage (Ramelt, 1991). B. Stewart in his research in the frame of value-based approach draws attention to the gap between book and market value: while in 1978 the gap was about 5-10%, in 1998 the market value exceeded the book value in average at three times (Stewart, 2001). Researches, who deal with value-based concept, associate this fact with the increasing role of intellectual capital in a new economy and called it " the knowledge economy" (Stern, Stewart, 2001).

Several researches, analyzing an intellectual capital in terms of knowledge management implementation, are trying to catch a connection between indirect characteristics of intellectual capital and performance of the company. The essential assumption of most empirical studies is that an indirect assessment of intellectual capital could be provided by financial statements analysis. It is obviously that the intangible characteristics of the company are very poorly expressed in financial terms. Therefore, we need to use information which could not be found in financial statements to assess the intellectual capital inputs and knowledge management implementation. Despite of the relevance of the intellectual capital issues existing studies show poor development and practical implementation of measuring tools. That dues to several limitations and shortcomings of knowledge management monitoring and assessment systems.

This paper is devoted to the problem identification and motivation and some empirical results are also presented here. The purpose of this research is a development of cost-effectiveness tools for knowledge management drivers identification. We suppose that the potential effectiveness of intellectual capital resources varies depending on the company size, industry and country.

2. Literature review

Analyzing the evolution of the intellectual capital concept, we can conclude that, unlike a common understanding of this phenomenon in the classical economics in the modern scientific and applied studies the interpretation of the intellectual capital is diversified. That could be easily explained by the multiple purposes of its study. Obviously, the intellectual capital phenomenon is described by

two categories: capital and intelligence (knowledge). The firstof these concepts reveals the essence of the phenomenon, and the second gives its basic definition.

Most of them are based exactly on the combination of the above mentioned properties such as 'capital' and 'intelligence'. For instance: 'Intellectual capital is the group of knowledge assets that are attributed to an organization and most significantly contribute to an improved competitive position of this organization by adding value to defined key stakeholders'(Marr, Schiuma, 2001). Analyzing this definition, we can conclude that intellectual capital is defined as a company's resource which should provide the additional value for stakeholders. That explains a simultaneous development of two intellectual capital concepts: resources-based and value-based approaches.

The ability to enhance an effectiveness of the others resources, including tangible assets is the key feature of intellectual capital. Knowledge management provides the whole set of tools for effective intangibles use. Despite specific features of intellectual resources they should be considered as a part of companies invested capital and characterized according to common approach to capital identification. Let us consider key attributes of intellectual capital associating it with tangibles assets (figure 1). According to common approach on the financial and economics basis the invested capital is characterized by following categories:

- amount of capital employed;
- return on capital employed;
- cost of capital employed.

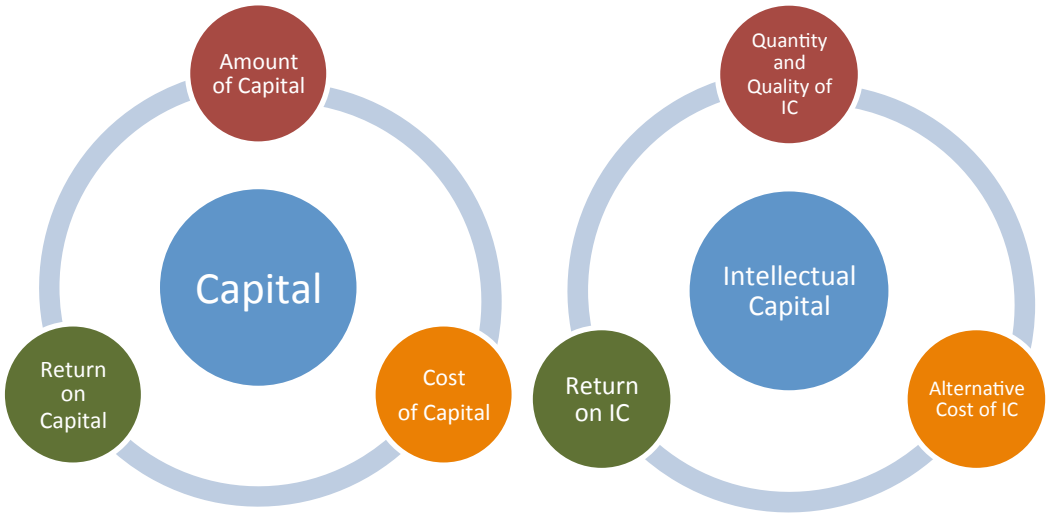

Figure 1: Common characteristics of intellectual resources as a part of company's capital

It should be noticed that intellectual capital is a heterogeneous resource. We need to split an intellectual capital into components and analyze each of them separately. A variety of intangibles compositions options are currently proposed and reasoned, including two- three-, four- and five-components structures (Edvinsson, Malone, 1997; Bontis, 1998, Stewart, 1997, Saint-Onge, 1996; Sveiby, 1997; Van Buuren, 1999; Roos,1998; O'Donnell, O'Regan, 2000). We are following an approach suggested by Roos and Stewart who identified three components of the intellectual capital: human (HC), relational (RC) and structural resources (SC) – Fig.1. This division fits good in a resource-based logic, as separately describes key areas of company management:

- HC - human resource management;
- RC - marketing (communication with customers, suppliers, partners and competitors);
- SC - processes engineering, organizational culture, innovation and technology

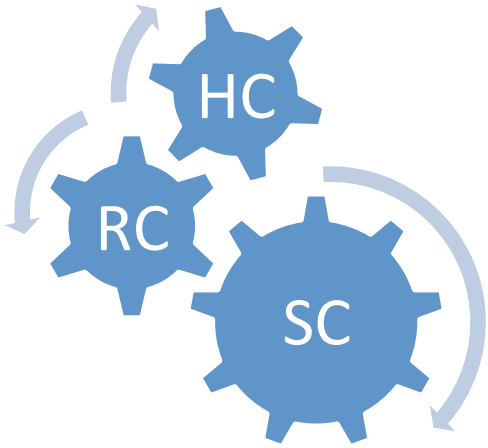

Figure 2: Three-component structure of intellectual capital

All intellectual capital components are strongly interconnected. Meanwhile many studies emphasize higher importance of a human capital; others pay more attention to the structural capital. We suppose that significance of each component is associated with a variety of factors, for instance belonging to a particular industry and country.

Many researchers argue that intellectual capital is becoming almost the only competitive advantage of the company in the new economy. The economic profit or residual income concepts are based on the fact that just the competitive advantages of a particular firm provide additional value creation. Therefore the close connection of the modern value-based management concepts and knowledge management becomes clear.

Despite the obvious logical relation and theoretical reasonableness of the assumptions mentioned above, this hypothesis testing leads to the contradictory results in empirical studies. We suppose that such results could be explained by shortcomings of the information field as well as unclear objective setting and incorrect research choosing instruments. Our study is based on the critical analysis of the relevant theoretical and empirical researches and seeks to take into account their experience for drawing more precise conclusion.

According to the relevant studies value created by the company, expressed in material form, depends largely on intangibles employed such as reputation and relationships with clients, staff competence, etc. now. In most researches intellectual capital are recognized as knowledge that can be converted into value (Edvinsson, Malone, 1997; Zeghal, Maaloul, 2010).

Consideration of the value added as one of the key productivity and efficiency indicators of intellectual capital have increasingly become the object of academic studies in recent years. Within the value-based approach following tools are comsidered as a proxy indicator of intellectual capital: economic value added (EVA©), future growth value (FGV©),Q-Tobin, real assets value enhancer (RAVE©) and value added of the intellectual capital (VAIC©). Meanwhile we are going to implement resource-based approach principles to get a comprehensive and complete description of all intellectual capital components.

An intellectual capital, which allows companies to create value added, is considered as a long-term growing point in new economy (Riahi-Belcaoui, 2003; Youndt, 2004). Several empirical researches were devoted to intellectual capital and value added analysis, for instance, Kurima who studied the Brazilian public companies (Kimura at al, 2010), Ozturk and Demirgunesa (Ozturk, Demirgunes, 2007), who examined companies listed on the ISE (Istanbul Stock Exchange), Diez who analyzed the value creation by Spanish firms (Diez JM et al, 2010), as well as many others. A statistical analysis allowed them to reveal a relationship between the intellectual capital and value added elements. However it remains unclear what share of value is created by physical or intellectual resources. Thus, despite a huge number of papers, covering issues mentioned above, (Pulic, 2000; Stewart, 2002; Chen, Cheng, Hwang, 2005; Tan et al, 2007; Zeghal, Maaloul, 2010) this research problem remains relevant and interesting for further studying..

The recent studies consider EVA as one of the key proxy indicators of intellectual capital (Lev, 1999, Pohlman, 2000; Stern, 2001; Riahi-Belkaoui, 2003). They argue that the economic profit is the welfare gains of the company through the effective use of resources. In the era of globalization and "the new economy" a role of tangible assets recedes into the background because they are not able to create the company's competitive advantage. As a result of the growing importance of investments in intangible assets in terms of value creation intellectual capital accumulation is increasing every year , exceeding the amount of investments in physical and financial capital in some countries. (Zeghal, Maaloul, 2010). Different researchers associate these changes of the investment strategy with the transition to knowledge economy (Stewart, 1997; Sveiby, 1997; Edvinsson, 1997; Lynn, 1998; Zeghal, 2000).

Despite a good theoretical validity some researchers strongly criticize this approach about intellectual capital evaluation. This criticism is mostly based on the empirical results. For instance, Fernandez has shown in his research that EVA© indicator is not able to measure even if the creation or destruction of value expressed in market capitalization (Fernandez, 2001). Meanwhile, according to some researches, an impact of the intellectual capital and its components on the company's value explains a spread between market capitalization and book value (Steward, 1999; Lev, 1999). The index, calculated as the ratio of market value of assets to their book value, is called q-Tobin. The idea of this approach is as follows: the more is a mentioned indicator the more is a spread between invested capital and potential return the more is an intellectual capital employed. If we assume that market capitalization reflects companies performance and especially intangibles outcomes, EVA© could not be used as an intellectual capital indicator. Furthermore some present relevant empirical studies sound conclusions about a low predictive power of almost all value-based models applied for intellectual capital analysis. (Bontis, Dragonetti, Jacobsen, Roos, 1999).

Another proxy indicator which is closely connected with economic profit is a value of future growth (FGV©). FGV© asses a share of market value attributed to EVA© growth. In accordance with J. Stern and B. Stewart FGV© can be driven by market expectations of productivity improvements, organic growth, and value-creating acquisitions. Companies can calibrate their incentive plan to performance targets tied to the annual EVA© growth implied by FGV©. Furthermore, the FGV© component can be a useful tool in benchmarking against the "growth plan" of competitors and evaluating investors' assessment of the wealth creation potential of new strategies and opportunities (Stern, Stewart, 2010). Several studies show that a share of the future growth value in several company's value grows every year, and in some industries are characterized by innovative products implementation (Burgman, Roos, 2005). This approach suggests the innovative behavior and investment policy focused on the intellectual capital accumulation have a higher potential of a future growth. Obviously that FGV© has similar shortcomings and limitation as EVA©. However this indicator gives clear interpretation about future opportunity of a particular company to increase

current value though intellectual capital employment. Therefore, a share of FGV© in market value could be considered as intellectual capital outcome in terms of value creation.

3. Research design

As we have mentioned above we try to synthesize value- and resource-based approaches in the intellectual capital study. However we primarily focus on the value-based approach goal-setting. It means that the idea and main assumption of this research is closely connected with relevant VBM models, in particular economic EVA©, FGV©, Q-Tobin. These indicators are considered as proxy indicators of intellectual capital outcomes in our research and present explained variables. Meanwhile we are going to implement resource-based approach principles to get a comprehensive and complete description of all intellectual capital components (intellectual capital inputs). Moreover we need to identify factors which support or prevent intellectual capital transformation in companies' performance (Figure 3).

Any link between performance outcomes and intellectual capital components is unlikely to be simple. Following this fact, four prominent have been tested during the research:

Hypothesis 1: *Economic value added, future growth value, Q-Tobin are proxy indicators of intellectual capital outcomes.*

Hypothesis 2: *Intellectual capital inputs can be described by proxy indicators, based on public available information about the company from its annual financial and statistical reports.*

Hypothesis 3: *There are internal (IC components configuration of the particular company and age) and external (country, industry, location) factors which influence on a transformation of intellectual capital in companies performance.*

Hypothesis 4: *There is a complementarity between intellectual capital components and that has an impact on company performance.*

With regard to these assumptions and literature background we use the following research framework:

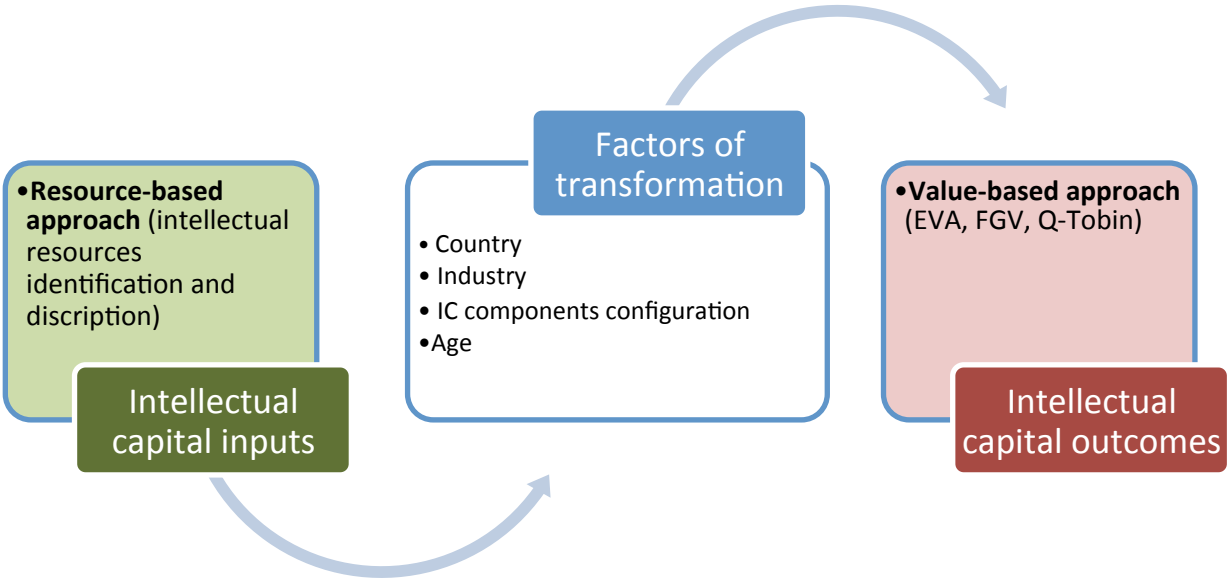

Figure 3: Framework of intellectual capital analysis (resource- and value-based approaches combination)

Taking into account that all components of intellectual capital are linked each other (Figure 2) we need to analyze some attributes of intangibles separately. A description of the intellectual capital attributes as well as examples of some indicators are presented hereinafter (Figure 4). According to above suggested approach (Figure 1) five characteristics of intangibles should be identified. We suppose all-around analysis would reveal important proxy characteristics and we would get good estimations of intellectual capital investments and knowledge management effectiveness. These indicators present explanatory (dependent) variables in our study.

Quantity of IC	•Proxy indicators of the amount of resources involved (number of employees, number of long-term contracts with customers and suppliers, the number of patents and licenses, trade marks)
Quality of IC	•Proxy indicators of quality of the resources involved (staff qualifications, value and exclusivity of long-term contracts with customers and suppliers, value of patents and licenses, brand power)
Return on IC components	• VAIC: HSE, CEE, SCE • RAVE: workonomics, supplynomics, custonomics
Return on IC	•EVA •FGV •Tobin's q
Alternative cost of IC	•return on alternative investments (inside and outside company)

Figure 4: Description of the intellectual capital attributes

This study investigates the local economic impact of intellectual capital components on Russian and European companies' performance. To assess economic impact we use a number of different dependent variables measured at the level of the individual firm.

Figure 5 provides a brief description of variables used in our study that were selected based on earlier studies and theoretical models. In order to capture possible relationships and significant internal and external factors, we also consider natural logarithms of the measures.

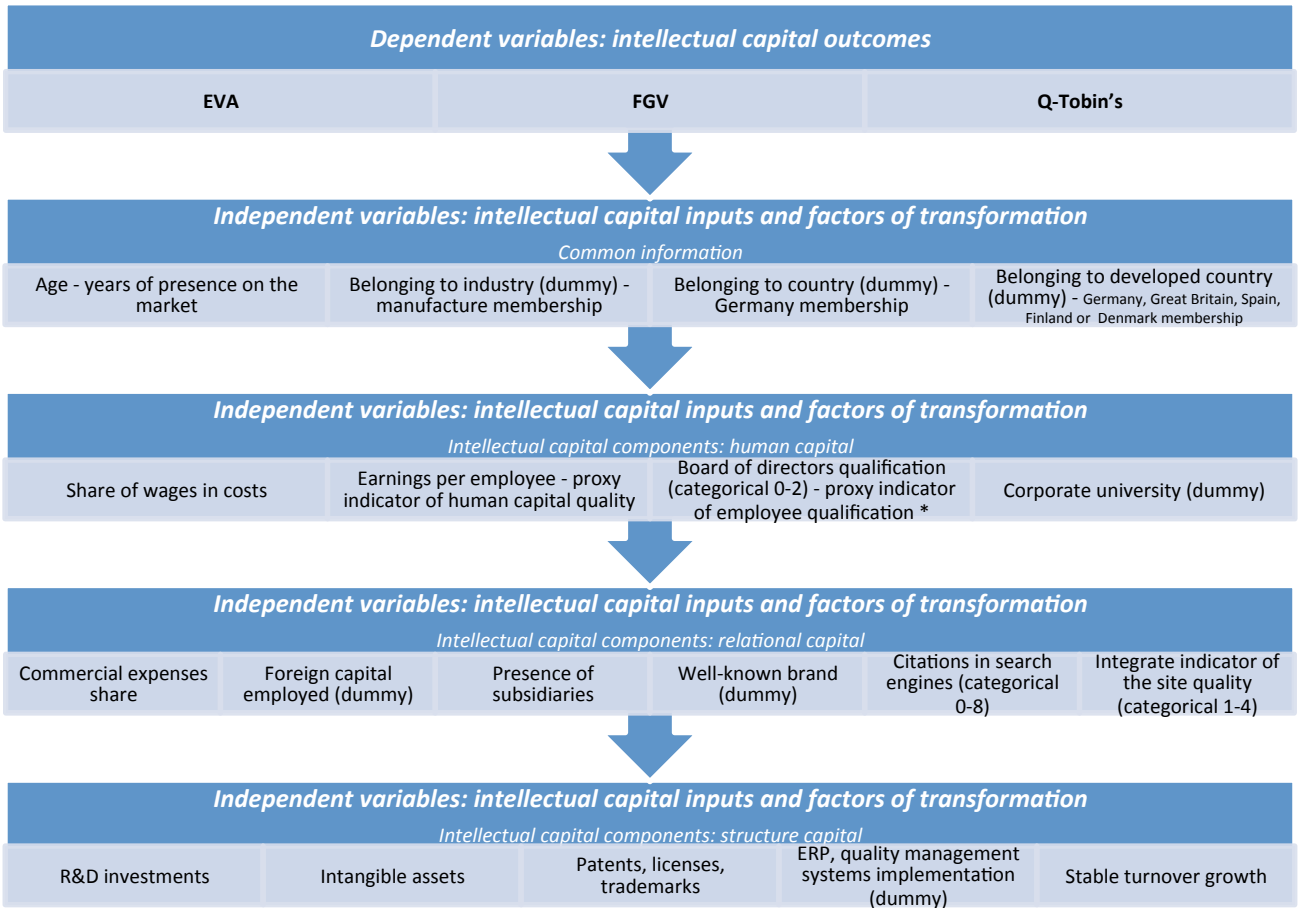

Figure 5: Variable list

Notes:

* Criteria:

- If more than a third of directors have postgraduate level of qualification and more than 5 years experience – 2 points.
- If more than a third of directors have postgraduate level of qualification or more than 5 years experience – 1 point.
- Another – 0.

** Criteria:

- Availability of information for investors.
- Multi-lingual information.
- Amount of information.
- Design.

Each categorical variable is transformed into dummy variable for linear regression analysis.

Before the empirical study results in the next section we will present the employed data.

4. Data and methodology

We have investigated firms from Russia and several European countries such as Serbia, Great Britain, Ukraine, Turkey, Finland, Denmark and Spain according to the country position in Knowledge Economy Index 2008 [http://data.worldbank.org/data-catalog/KEI]. Also we only have analyzed companies from industries with the predominance of varied intellectual capital components and therefore different intellectual capital configuration. So that, we have selected the following industries: financial services, wholesale and retail trade; machinery and equipment manufacture; chemical; transport and communications. We have chosen these particular industries since they represent a wide range of knowledge-intensive manufacturing and service sectors.

The datasets in this study erw derived from a combination of several detailed longitudinal databases FIRA PRO and SPARK-INTERFAX for Russia and Bureau Van Dijk (Amadeus and Ruslana) for Europe based on the companies' annual statistical and financial reports. Due to intellectual capital nature and our goals we have used many qualitative data from web-sites, magazines, citation bases, data from patent bureaus and etc.

We have used the following criteria when deciding on the inclusion of firms in the sample:

- Number of employees should be no less than 500 and no more than 20 000 people.
- Firm should belong to public company.

As a result, the Russia and Europe databases include information on 420 and 332 firms over 2005-2009 years, respectively. The dataset compiled by the authors includes the following information:

- *Common indicators* – form and structure of ownership, company age, industry and enterprise code, location, patents and licenses.
- *Economic indicators* – costs, export, R&D expenditures, capital investments, working capital
- *Financial indicators* – operating profit, company profitability, economic value added, future gross value and Q-Tobin coefficient etc.
- *Specific intellectual capital indicators* – VAIC, brands, quality of web-site, and others.

Table 1 helps us to characterize the type of a company that was used in our research. It presents several descriptive objectives of the sample, where the mean and the standard deviation of the variables are detailed:

Table 1: The sample descriptive adjectives

Indicator	Europe			Russia		
	Objects observation numbers	Mean	St. deviation	Objects observation numbers	Mean	St. deviation
Age, years	1 595	38,75	32,77	495	36,49	38,50
Number of employee, people	1 635	4 119,18	4 319,45	359	7 551,90	13 146,85
Net capital expenses, th. euro	1 635	0,00	0,00	392	1,09E6	8,35E6
Invested capital, th. euro	1 378	521 236,30	1,23E6	491	3,72E7	1,04E8
Operating margin	1 526	0,03	0,30	490	,06	,39
Earnings per employee, th.euro/people	1 594	26,51	111,24	355	39 003,67	1,44E5
R&D investments, th.euro	217	24 865,26	34 058,65	281	23 465,37	79 116,03
EVA, th.euro	1 351	- 425,89	1,30E5	391	- 280 970,62	1,92E7
Q-Tobin	1 126	0,97	1,14			
FGV, th.euro	991	1 033 513,54	244 0411,33			

As shown in table 1, we can detect R&D investments only for 217 from 1635 of objectives for Europe database. Others objectives in the databases are classified as “system missing”. Despite this factor importance we decided to exclude them from our research for not reducing the sample.

Let us now turn to EVA and intellectual capital indicators for our sample. According to the established approach to the competitiveness theory and intellectual capital concept, the higher intellectual capital efficiency degree is the more competitive and successful is a company, as measured by EVA, FGV and other measures.

5. Empirical results

As mentioned earlier, the interest in the study of intellectual capital emerges due to their assumed ability to enhance the value creation. Nevertheless, empirical research offers contradictory results that, on occasions, calls into question the statements made in the papers that study this link.

It should be clear that we do not combine the Russia and Europe samples because of vary distinctions between countries and firms, respectively. Therefore, we have constructed separate equations and gave different outcomes. Nevertheless, we try to use standardized variables wherever possible.

Our core econometric specification is as follows:

$$Perf = \alpha + (\beta 1, ..., \beta n)\, HC + (\delta 1, ..., \delta n)\, SC + (\delta 1, ..., \delta n)\, RC + (\lambda 1, ..., \lambda n)\, Dummy + \varepsilon,$$

where
Perf - an indicator of the performance of companies (EVA; Q-Tobin; FGV as independent variables);
HC - a vector of variables responsible for human capital component;
SC - a vector of variables responsible for structural capital component;
RC – a vector of variables responsible for relational capital component;
Dummy - a vector of dummy variables introduced in the analysis.

OLS method is used for regression equation coefficient estimation. There is no statistically significant spatial correlation existing between the independent variables.

This model is developed in accordance with the concept of financial architecture based on assumptions about the exogenous variables of the structure ownership and capital structure. In this case, the measurement performance companies is conducted in the context of the three indicators, which allowed reducing the level of subjectivity in the choice of favor of an indicator, and also provided an opportunity to compare the results. For each case we have constructed three models: for quantitative and qualitative factors only as well as for their combination for checking the robustness of our results[12].

In case of Hypothesis 1 – 2 confirmations, we expect the statistical significance of models in whole. For hypothesis 3 confirmation, the variables reflecting intellectual capital components need to be statistically significant. The results of the regression analyses for Russian companies are shown in Table 2.

[2] We tested different specifications of our general model but in this paper we show only most important of them.

Table 2: Regression results for Russian companies

Dependent variable	Equation 1		Equation 2	
	EVA		EVA	
Predictors	**B**	**Sig.**	**β**	**Sig.**
Age	18985,62	0,652		
Presence of subsidiaries	**-189892,87**	**0,000*** **	-33457,27	0,520
Share of wages in costs	1323043,12	0,633		
Earnings per employee	**60,68**	**0,000*** **	**139,25**	**0,000*** **
Commercial expensses share	-6416654,11	0,348		
R&D investments	**-114,90**	**0,059** **	**-284,92**	**0,000*** **
Intangible assets	**11,72**	**0,000*** **	**15,84**	**0,000*** **
Patents, licenses, trademarks	**58545,78**	**0,000*** **	**100740,82**	**0,000*** **
Belonging to the industry (manufacture)	-1807588,61	0,567	-650181,04	0,818
Board of direction's qualification			-5791352,67	**0,048** **
High web-site quality			2260022,60	0,437
High citation in search engines			-2827511,87	0,382
Well-known brand			-6,85E7	**0,000*** **
ERP, quality management			-1013999,84	0,71
Stable growth			-2874210,52	0,23
Constant	4343271,48	0,27	4619975,902	0,22
Prob>F	**0,000*** **		**0,000*** **	
Adj. R-square	**0,325**		**0,718**	
Observation numbers	159		117	

Notes: * Significant at p<0.1. ** Significant at p< 0.05. *** Significant at p<0.001.

The explanatory models power is 32.5% for the first equation and 71.8% for the second one. They are significant on 1% probability level. Therefore we can confirm hypotheses 1 and 2 and can use EVA and statistical significant factors as intellectual capital output and input for Russian companies respectively.

For both models we have found the positive statistical significant link for dependent variable with earnings per employee, intangible assets and number of patents, trademarks and licenses. For R&D investments we have revealed the negative sign and this result is revealed and can be explained by long term return and high risks in emerging markets. Interesting that, for Europe countries we received the positive link between variables.

The second step of our empirical study is a search for the relationship between company's performance indicators and qualitative factors of intellectual capital. The results of estimation are shown in table 3.

Table 3: Regression results for European companies: qualitative factors[1]

Dependent variable	Equation 1		Equation 2	
	EVA		FGV	
Predictors	**B**	**Sig.**	**β**	**Sig.**
Well-known brand	**83270,76**	**,000*** **	**1717297,19**	**,000*** **
ERP, quality management	**35119,83**	**,002** **	**357774,778**	**,047** **
Corporate stratagy	-14282,84	,160	**-458037,11**	**,010** **
Stable growth	**-57139,75**	**,013** **	69245,52	,893
Board of director's qualification	**30062,95**	**,003** **	**727703,15**	**,000*** **
Belonging to the country (Germany)	-15620,14	,208	27602,68	,887
Belonging to the industry (manufacture)	11267,30	,243	280076,05	,124
High citation in search engines	**37016,11**	**,002** **	**1467750,29**	**,000*** **
High web-site quality	**-31587,76**	**,002** **	-180206,51	,342
Constant	11857,21	,255	298100,04	,114
Prob>F	**0,000*** **		**,000*** **	
Adj. R-square	**,079**		**,185**	
Observation numbers	1004		758	

Notes: 1 – The model where Q-Tobin coefficient was seen as dependent variable is statistical insignificant.
* Significant at p<0.1. ** Significant at p< 0.05. *** Significant at p<0.001.

As was expected, both models are significant and the coefficients for well-known brand, ERP system presence as well as qualification of BD and citations in search engines indicators are positively associated with EVA and FGV. In spite of the fact that the explanatory model power is low, our equation is significant on 1% probability level, we can confirm hypotheses 1-3.

Let us now find the indicators of intellectual components for European countries. For this purpose we have combined quantitative and qualitative factors and tried to find the relationship between them and intellectual capital outcomes. We believe that those variables which will be statistically significant in all equations can be considered as such indicators. The results are shown in table 4:

Table 4: Regression results for European companies: combination of quantitative and qualitative factors

Dependent variable	Equation 1		Equation 2		Equation 3	
	EVA		Q-Tobin		FGV	
Predictors	**β**	**Sig.**	**β**	**Sig.**	**β**	**Sig.**
Presence of subsidiaries	**-69,23**	**0,073***	-2,47E-5	0,950	846,38	0,188
Board of director's qualification	11478,95	0,105	-0,07	0,372	**382978,83**	**0,002** **
Earnings per employee	**527,11**	**0,000*** **	**0,001**	**0,000*** **	**4904,05**	**0,000*** **
Patents, licenses, trade marks	-43,36	0,269	**0,001**	**0,005** **	**1628,11**	**0,013** **
Intangible assets	**0,04**	**0,000*** **	**-2,81E-7**	**0,000*** **	**2,21**	**0,000*** **
High citation in search engines	8232,382	0,359	0,004	0,967	**806575,89**	**0,000*** **
High web-site quality	**-26383,83**	**0,000*** **	-0,02	0,843	**-312020,67**	**0,026** **
Well-known brand	**25128,30**	**0,032** **	**0,40**	**0,001*** **	**501949,68**	**0,009** **
ERP, quality management	**23201,67**	**0,006** **	-,12	0,163	181011,09	0,196
Belonging to the industry (manufacture)	**14253,27**	**0,049** **	,14	0,102	-19668,53	0,891
Belonging to the country (Germany)	**12484,92**	**0,077***	**,18**	**0,021** **	-162846,28	0,200
Age	**-243,02**	**0,012** **	**-,002**	**0,024** **	-20,33	0,990
Constant	-10296,06	0,174	,97	0,950	152065,18	0,369
Prob>F	**0,000*** **		**0,000*** **		**0,000*** **	
Adj. R-square	**0,307**		**0,056**		**0,486**	
Observation numbers	1256		1013		953	

Notes: * Significant at p<0.1. ** Significant at p< 0.05. *** Significant at p<0.001.

Table 4 provides key results and evidence for two findings of this model. First, according to hypothesis 3 confirmation, there are three intellectual component inputs indicators which can be used in the diagnosis of the firm's intellectual capital configuration:

- Earnings per employee (human capital).
- Intangible assets (structural capital).
- Well-known brand (relational capital).

Second, both industry (manufacture) and country (Germany) specific features are associated with higher intellectual capital outcomes.

The last stage of our research is a testing of hypothesis 4 both for Russian and European companies. We assume that IC components are connected with each other not additively but multiplicatively. Due to testing this assumption we have constructed the following model:

$$Perf = \alpha * \beta_1 HC * \delta_1 SC * \lambda_1 RC * \varepsilon$$

or (after logarithmic procedure) $$lnPerf = \alpha + \beta_1 lnHC + \delta_1 lnSC + \lambda 1 lnRC + \varepsilon$$

where
Perf - an indicator of the performance of companies (EVA; Q- Tobin; FGV as independent variables);
HC - a variable responsible for human capital component;
SC - a variable responsible for structural capital component;
RC – a variable responsible for relational capital component.

We have used intellectual component inputs obtained in previous model as independent variables for human and structural capital except relation component. We have to replace well-known brand variable to commercial expenses share due to its nominal scale. The results are shown in table 5:

Table 5: Complementarity for IC components for Russian and European firms

Dependent variable	**Russia**		**Europe**					
	Equation 1		**Equation 1**		**Equation 2**		**Equation 3**	
	lnEVA		**lnEVA**		**lnQ-Tobin**		**lnFGV**	
Predictors	**β**	**Sig.**	**B**	**Sig.**	**β**	**Sig.**	**β**	**Sig.**
Commercial expenses (RC)	**0,35**	**0,005****	0,04	0,766	0,09	0,147	0,06	0,489
Earnings per employee (HC)	0,34	0,415	**0,70**	**0,000*****	**0,31**	**0,000*****	**0,27**	**0,000*****
Intangible assets (SC)	**0,23**	**0,001*****	**0,14**	**0,005****	**-0,13**	**0,000*****	**0,40**	**0,000*****
Belonging to the industry (manufacture)	**-1,97**	**0,010****	0,23	0,256	0,05	0,602	-0,19	0,180
Belonging to developed country			**-1,19**	**0,057***	**0,54**	**,008****	**-1,21**	**0,000*****
Constant	10,10	,000	7,05	0,000	0,029	0,940	9,03	0,000
F	26,39		14,83		18,26		36,90	
Prob>F	**0,000*****		**0,000*****		**0,000*****		**0,000*****	
Adj. R-square	0,77		0,32		0,27		0,46	
Observation numbers	38		177		279		243	

Notes: * Significant at p<0.1. ** Significant at p< 0.05. *** Significant at p<0.001.

We can conclude that for Russian companies a complementarity between relational and structural capital components exists while for European firms - between human and structural capital. At the same time, the presence of complementary IC components also has an important positive influence on the IC performance outcomes for all of them.

6. Conclusion

We can draw some conclusions which are based on theoretical and empirical parts of our research.

1. A high explanatory power of EVA and FGV indicators as an indicator of the intellectual capital outcomes was confirmed. Meanwhile widespread Q-Tobin indicator seems to be not so well in explaining the transformation of the intellectual capital inputs in the company's value even on developed markets.
2. A validity of intellectual capital proxy indicators use was proved. Namely we could obtain the information of some company's internal factors of knowledge management learning public available data. Many of the selected indicators showed a high significance in the specified models and are obviously interpreted in terms of theory and practice of knowledge management.
3. Some significant internal and external factors of intellectual capital transformation were revealed. For instance: company age, country (especially Russia and European countries), industry. Significant differences between developed and developing markets were found out. Relational and human capital showed a higher significant in developed countries, while in Russia structural characteristics present growing point in most of corporations.
4. However, some indicators affect on company's performance not so obviously. For example, a negative correlation between R&D expenses and value added has been found out in Russia. This phenomenon could be explained by high risk of this investment and low protection of intellectual property in Russia.
5. A high complementarity of intellectual capital components should be noticed. Moreover, combinations of interconnected elements are different in Russia and Europe. That could be also explained by different level of these components significance in analyzed markets.

We can conclude that our results require further precise analysis. For example, we need to assume a possible regressors endogeneity, as well as take into account the lagged nature of some intellectual capital inputs and outcomes. However we have obtained some preliminary results that could be used by knowledge management design and implementation.

7. References

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