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Preface

These proceedings represent the work of presenters at the 12th European Conference on Knowledge Management (ECKM 2011). We are delighted to be hosting the 12th annual ECKM at the University of Passau, Germany.

We are pleased to welcome three keynote speakers to the conference. On the first morning we will hear Prof. Dr. Ronald Maier, from Leopold-Franzens-University of Innsbruck, Austria talk about “Re-focusing knowledge management: concepts of knowledge maturing”. In the afternoon we welcome Ms Latha Alaguvelu, from Infosys Limited, Bangalore, India who will address the topic “Emerging approaches to organizational learning”. Finally on the second morning we will hear from Prof. Dr. Klaus Tochtermann, from ZBW – Leibniz Information Centre for Economics, Germany, talk about “10 years of Knowledge Management – will another 10 years follow?”.

A primary aim of this conference is for academics concerned with current research findings and for those from the wider community involved in Knowledge Management, to present their findings and ideas to peers from Knowledge Management and associated fields. We also hope that the conference provides a platform for practitioners and academics across the field of Knowledge Management to meet those who hold ideas in a face to face interaction, forge long-lasting networks and linkages with colleagues from similar areas of interests. We hope that the conference will help attendees advance in their understanding of how firms and countries generate and exploit knowledge to achieve a competitive advantage, and drive their innovations forward. The range of issues and mix of approaches followed will ensure an interesting two days.

304 initial abstracts were received for this conference. However, the academic rigueur of ECKM meant that, after the double blind, peer review process there are 137 papers published in these Conference Proceedings. These papers reflect the growth in the field of Knowledge Management, and they represent truly global research from some 40 different countries, including Australia, Austria, Belgium, Boznia and Herzegovina, Brazil, Bulgaria, Canada, Columbia, Cuba, Czech Republic, Egypt, Estonia, Finland, France, Germany, Greece, Hong Kong, Hungary, Iran, Ireland, Italy, Jordan, Latvia, New Zealand, Norway, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Taiwan, The Netherlands, Turkey, United Kingdom, USA.

We hope that you have an enjoyable conference.

Dr. Franz Lehner and Dr. Klaus Bredl

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 the new economy. Intellectual capital identification and evaluation is one of the most important issues in knowledge management. Our study focuses on the evaluating intellectual capital methods that 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 a company size, industry and country. The majority of the relevant researches are based on resource- and value-based approaches that separately analyze the intellectual capital from a certain point of view, limiting the number of problems at concurrence of these concepts. Therefore, to solve problems of intellectual capital evaluation we integrate two approaches that are relevant for studying the companies' and industries' behavior.
We seek to integrate two approaches to answer following questions:

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

Despite the large empirical background the intellectual capital management issues fundamentally are not well studied. The purpose of this research is the development of cost-effectiveness tools for analyzing the company's intellectual resources. 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 the intellectual capital evaluation, for example, strategic performance indicators (EVA, FGV, Q-Tobin).It should be emphasized, that a number of required data are quite specific and hardly observed. Thus, the data base of this research founds on the annual statistical and financial reports including the 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.

Keywords: intellectual capital inputs and outcomes; economic value added

1. Introduction

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

Our study focuses on the methods of intellectual capital evaluation, in particular, on key value drivers' identification and their relationship analysis. This approach allows finding out the most efficient way of knowledge management, including making an investment decision. It should be emphasized that the 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 a company's performance.

Most of the relevant studies are based on resource- and value-based approaches that separately analyze the intellectual capital from a certain point of view, limiting the number of problems at the concurrence of these concepts. Therefore, we've integrated two approaches to solve the problems of intellectual capital evaluation that are relevant for the study of companies' and industries' behavior. The idea of the intellectual capital research in the resource-based approach is associated with

P. Ramelt, who showed empirically the predominance of intra-over inter-sectoral differences in the ratio of 7:1. This confirms the organizational factors dominance as a company's competitive advantage (Ramelt, 1991). B. Stewart in his research as part of a value-based approach draws attention to the gap between the book and market value: while in 1978 the gap was about 5-10%, in 1998 the market value exceeded the book value by three times in average (Stewart, 2001). The researches dealing with value-based concept refer this fact to the increasing role of the intellectual capital in the new economy, calling it "the knowledge economy" (Stern, Stewart, 2001).

Several researches, analyzing the intellectual capital in terms of knowledge management implementation, are trying to catch a connection between indirect characteristics of intellectual capital and performance of a company. The most of empirical studies essentially assume that an indirect assessment of intellectual capital could be provided by the financial statement analysis. Obviously, the intangible characteristics of a company are very poorly expressed in financial terms. Therefore, we need to use the information that could not be found in financial statements to assess the intellectual capital inputs and knowledge management implementation. Despite the relevance of the intellectual capital issues the existing studies show poor development and practical implementation of measuring tools. This results from a number of limitations and shortcomings of the knowledge management monitoring and assessment systems.

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

2. Literature review

Analyzing the evolution of the intellectual capital concept, we can conclude that, compared to a common comprehension of this phenomenon in the classical economics, in the modern scientific and applied studies the interpretation of the intellectual capital is yet 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 first of these concepts reveals the essence of the phenomenon, while the latter provides its basic definition.

Most of concepts are based exactly on the combination of the above mentioned attributes, 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 the intellectual capital is defined as a company's resource that should provide the additional value for stakeholders. That explains the simultaneous development of two intellectual capital concepts: the resources-based and value-based approaches.

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

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

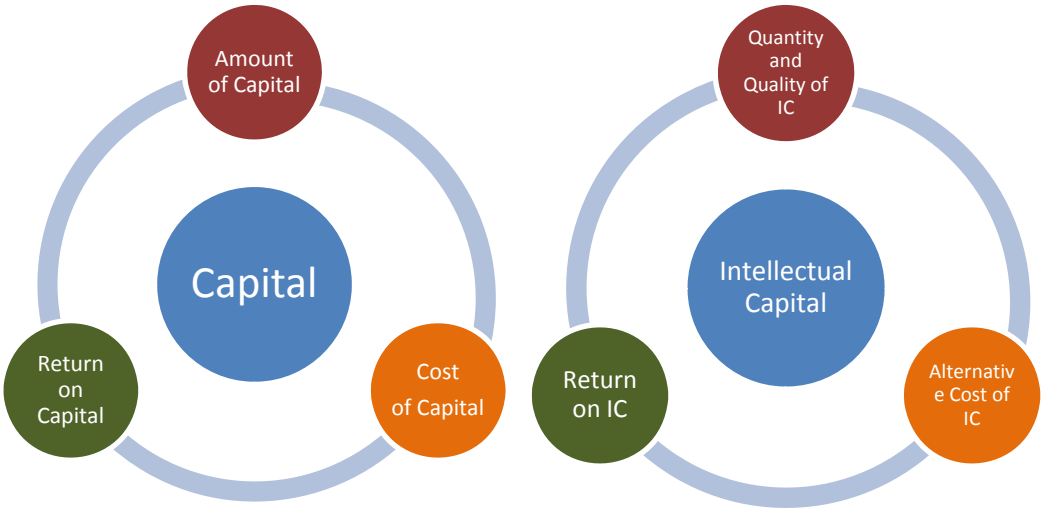

Figure 1: Common characteristics of intellectual resources as part of company's capital

It should be noted that the intellectual capital is a heterogeneous resource. We need to split the intellectual capital into components and analyze each of them separately. A variety of options for intangibles' combinations are currently proposed and reasoned, including two- three-, four- and five-component structures (Edvinsson, Malone, 1997; Bontis, 1998, Stewart, 1997, Saint-Onge, 1996; Sveiby, 1997; Van Buren, 1999; Roos, 1998; O'Donnell, O'Regan, 2000). We are following the 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 in the resource-based logic, as it separately describes key areas of a company management:

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

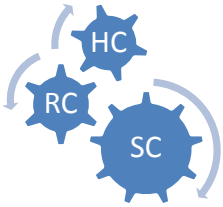

Figure 2: Three-component structure of intellectual capital

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

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

Despite the obvious logical relation and theoretical reasonableness of the assumptions mentioned above, testing of this hypothesis brings out 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 choice of research 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 applicable studies, the value created by a company, expressed in material form, now depends largely on intangibles employed such as reputation and relationships with clients, staff competence, etc.. In most researches, the intellectual capital is recognized as knowledge that can be converted into value (Edvinsson, Malone, 1997; Zéghal, Maaloul, 2010).

Consideration of the value added as one of the key productivity and efficiency indicators of intellectual capital has been an increasingly common subject of academic studies in recent years. Within the value-based approach, the following tools are considered the proxy indicator of the 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 the resource-based approach principles to obtain a comprehensive and complete description of all intellectual capital components.

The intellectual capital, which allows companies to create the value added, is considered a long-term growing point in the new economy (Riahi-Belkaoui, 2003; Youndt, 2004). Several empirical researches were devoted to the intellectual capital and value added analysis, for instance, Kimura who studied the Brazilian public companies (Kimura et al, 2010), Öztürk and *Demirgüneş*, (Öztürk, *Demirgüneş*,, 2007), who examined companies listed on the ISE (Istanbul Stock Exchange), *Dí*ez who analyzed the value creation by Spanish companies (*Dí*ez JM et al, 2010), as well as many others. The statistical analysis allowed them to reveal a relationship between the intellectual capital and the value added elements. However, it remains unclear which share of value is created by physical or intellectual resources, respectively. Thus, with the plentiful works covering the issues mentioned above, (Pulić, 2000; Stewart, 2002; Chen, Cheng, Hwang, 2005; Tan et al, 2007; Zéghal, Maaloul, 2010) this research problem remains relevant and interesting for further studying.

The recent studies regard 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", the role of tangible assets recedes into the background since they are unable to create the company's competitive advantage. As a result of the growing importance of investments in intangible assets in terms of value creation, the intellectual capital accumulation increases every year, exceeding the amount of investments in the physical and financial capital in some countries. (Zéghal, Maaloul, 2010). Many researchers associate these changes of the investment strategy with the transition to the knowledge economy (Stewart, 1997; Sveiby, 1997; Edvinsson, 1997; Lynn, 1998; Zéghal, 2000).

Despite its sufficient theoretical validity, some researchers strongly criticize this approach to the intellectual capital evaluation; this criticism is generally based on the empirical results. For instance, in his research Fernandez has shown that EVA© indicator is unable to measure even if the creation or destruction of value is expressed in the market capitalization (Fernandez, 2001). Meanwhile, according to some researches, an impact of the intellectual capital and its components on the company's value explains the 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 higher this indicator is, the higher the spread between invested capital and potential return is and the greater the intellectual capital employed is. If we assume that the market capitalization reflects companies' performance and especially intangible outcomes, EVA© could not be used as an intellectual capital indicator. Furthermore, a number of sound conclusions of existing relevant empirical studies regarding the low predicative power of almost all value-based models were applied during the intellectual capital analysis. (Bontis, Dragonetti, Jacobsen, Roos, 1999).

Value of future growth (FGV©) is another proxy indicator closely connected with economic profit. FGV© assesses the share of market value attributed to the EVA© growth. Following J. Stern and B. Stewart, FGV© can be driven by market expectations of productivity improvements, organic growth, and value-creating acquisitions. Companies can tailor 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 the share of the future growth value in the value of a number of companies increases yearly, while in some industries it is characterized by innovative products implementation (Burgman,

Roos, 2005). This approach suggests that the innovative behavior and investment policy focused on the intellectual capital accumulation possess higher potential of the future growth. Obviously, FGV© has similar shortcomings and limitations like EVA©. However, this indicator provides clear interpretation of the future opportunity of a particular company to increase its current value through intellectual capital employment. Therefore, a share of FGV© in the market value could be considered the intellectual capital outcome in terms of value creation.

3. Research design

As we have mentioned above we are trying herein 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, with economic EVA©, FGV©, and Q-Tobin. These indicators are considered the proxy indicators of intellectual capital outcomes in our research and present explained variables. Meanwhile, we are going to implement the resource-based approach principles to obtain a comprehensive and complete description of all intellectual capital components (intellectual capital inputs). Moreover, we need to identify factors that support or impede the intellectual capital transformation in the companies' performance (Figure 3).

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

> *Hypothesis 1: Economic value added, future growth value and 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 a 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 that influence transformation of intellectual capital in companies' performance.*
>
> *Hypothesis 4: There is a complementarity between intellectual capital components that impacts company performance.*

With regard to these assumptions and literature background we use the following research framework: Given that all components of intellectual capital are interlinked (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 the above-suggested approach (Figure 1), five characteristics of intangibles should be identified. We suppose that the all-around analysis would reveal important proxy characteristics to provide us with adequate estimations of intellectual capital investments and knowledge management effectiveness. These indicators present explanatory (dependent) variables in our study.

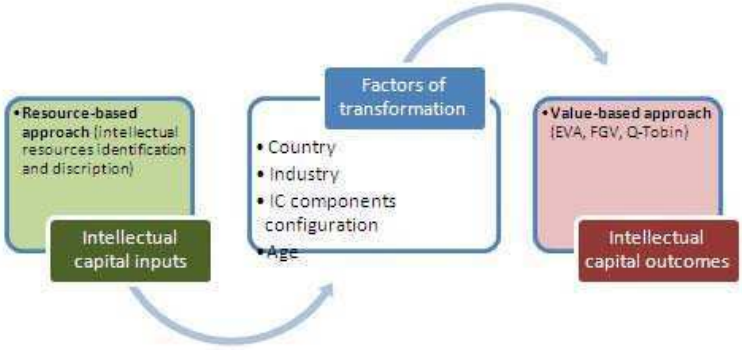

Figure 3: Framework of intellectual capital analysis (resource- and value-based approaches' combination)

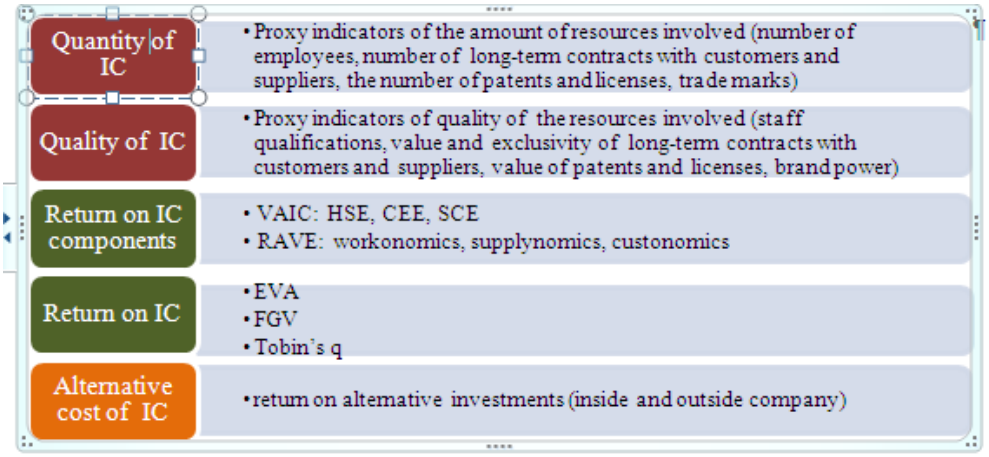

Figure 4: Description of the intellectual capital attributes

This study examines the local economic impact of intellectual capital components on Russian and European companies' performance. To assess the economic impact we use a number of different dependent variables measured at the level of an individual company. Figure 5 provides a brief description of variables used in our study, which 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.

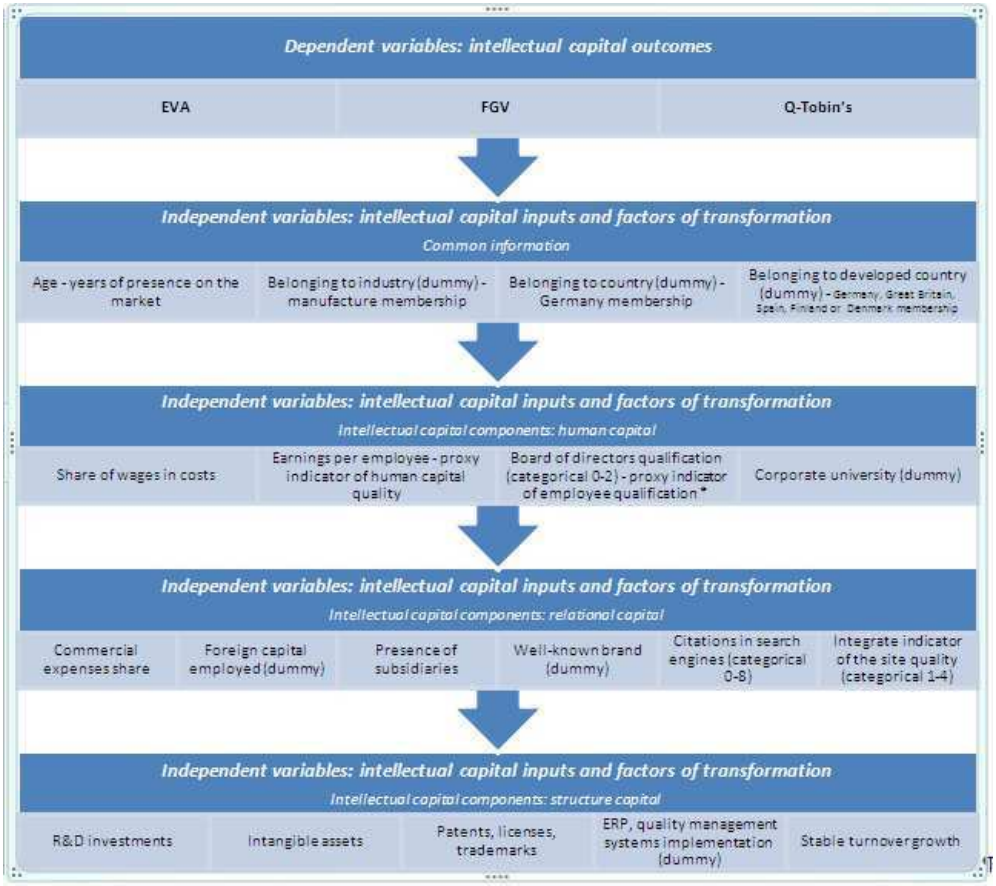

Figure 5: Variable list

Notes:
* Criteria:

- If more than one third of directors have postgraduate level of qualification and more than 5 years experience – 2 points.

- If more than one 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 a dummy variable for the linear regression analysis.

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

4. Data and methodology

We have studied companies from Russia and a number of European countries including Serbia, Great Britain, Ukraine, Turkey, Finland, Denmark, and Spain, based on a country position in Knowledge Economy Index 2008 [http://data.worldbank.org/data-catalog/KEI]. Also, we have only analyzed the companies from industries with the predominance of varied intellectual capital components and therefore different intellectual capital configuration. That way, we have selected the following industries: financial services, wholesale and retail trade, machinery and equipment manufacture, chemical, and 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 derive from 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. Owing to the intellectual capital nature and in line with our objectives we have used multiple qualitative data from web-sites, magazines, citation bases, data from patent bureaus, etc.

We have applied the following criteria when deciding on the inclusion of companies into the sample:

- Number of employees should be no less than 500 and no more than 20,000 people.
- A company should refer to the public company.

Accordingly, the Russian and European databases included information on 420 and 332 companies 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, and 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 type of the company that was used in our research. It presents several descriptive statistics of the sample, where the mean and the standard deviation of the variables are detailed:

Table 1: The sample descriptive statistics

Indicator	Europe			Russia		
	Objects observation numbers	Mean	St. deviation	Objects observation numbers	Mean	St. deviation
Age, years	1 595	39	33	495	36	39
Number of employee, people	1 635	4 119	4 319	359	7 552	13 147
Net capital expenses, th. euro	1 635	0,00	0,00	392	27 250	208 750
Invested capital, th. euro	1 378	521 236,30	1,23E6	491	930 000	2,6E6
Operating margin	1 526	0,03	0,30	490	0,00	0,01
Earnings per employee, th.euro/people	1 594	26,51	111,24	355	975,09	3600
R&D investments, th.euro	217	24 865,26	34 058,65	281	586,63	1977,90
EVA, th.euro	1 351	- 425,89	1,30E5	391	-7024,27	4,2E5
Q-Tobin	1 126	0,97	1,14			
FGV, th.euro	991	1 033 513,54	244 0411,33			

As seen in Table 1, we can detect R&D investments only for 217 out of 1635 adjectives for the European database. Others adjectives in the databases are classified as “system-missing”. Despite the importance of these indicators, we’ve decided to exclude them from our research so as not to reduce 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 the intellectual capital efficiency degree is, the more competitive and successful a company is, as measured by EVA, FGV and other measures.

5. Empirical results

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

It should be made clear that we do not combine the Russian and European samples due to the distinctions between countries and companies, respectively. Therefore, we have constructed separate equations and provided different outcomes. Nevertheless, we try to use the standardized variables wherever possible.

Our core econometric specification is, as follows:

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

where

- Perf is an indicator of the performance of companies (EVA; Q-Tobin; FGV as independent variables);
- HC is a vector of variables responsible for human capital component;
- SC is a vector of variables responsible for structural capital component;
- RC is a vector of variables responsible for relational capital component;
- Dummy is 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 regarding the exogenous variables of the structure ownership and the capital structure. In this case, the measurement of the companies' performance was conducted in the context of three indicators, which allowed reducing the human factor in deciding on an indicator, and also enabled comparing the results. For each case, we have constructed three models: for quantitative and qualitative factors separately, as well as for their combination for checking the robustness of our results. Though we've tested different specifications of our general model for finding out the most valuable of them in terms of robustness and effectiveness of estimates, in this paper we show the most significant of them only. In case of the Hypothesis 1 – 2 confirmations, we expect the statistical significance of models, in general. For the Hypothesis 3 confirmation, the variables reflecting the intellectual capital components need to be statistically significant. The results of the regression analyses for Russian companies are given in Table 2.

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 use EVA and statistical significant factors as the 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 discovered the negative sign and this result is revealed and can be explained by long-term return and high risks in emerging markets. It is interesting to note that for the European countries we've received the positive link between the variables.

The second step of our empirical study is a search for the relationship between the company's performance indicators and the qualitative factors of the intellectual capital. The results of the estimation are shown given 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 associated with EVA and FGV positively. In spite of the fact that the explanatory model power is low, our equation is significant on 1% probability level, thus, we can confirm Hypotheses 1-3.

Let us now identify the indicators of intellectual components for European countries. For this purpose, we have combined quantitative and qualitative factors, and tried to find the relationship among them and the intellectual capital outcomes. We believe that the variables that will be statistically significant in all equations can be considered such indicators. The results are given 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 the Hypothesis 3 confirmation, there are three intellectual component inputs' indicators that can be used in determination of the company'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.

Testing of Hypothesis 4 both for Russian and European companies is the final stage of our research. We assume that the IC components are interconnected not additively but multiplicatively. As a result of testing of 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 is an indicator of the performance of companies (EVA; Q- Tobin; FGV as independent variables);
- HC is a variable responsible for human capital component;
- SC is a variable responsible for structural capital component;
- RC is a variable responsible for relational capital component.

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

Table 5: Complementarity for the IC components for Russian and European companies

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 there's a complementarity among relational and structural capital components, while for European companies it is observed between human and structural capital. At the same time, the presence of complementary among IC components has also significant positive influence on the IC performance outcomes for all of them.

It should be noticed that all our models were tested for autocorrelation and heteroskedasticity via Durbin-Watson test and residual's scatter-plot. As a result we can conclude that our estimates can be considered as the effective and unbiased.

6. Conclusion

We can draw a number of conclusions based on theoretical and empirical parts of our research.

- The high explanatory power of EVA and FGV indicators as indicators of the intellectual capital outcomes was confirmed. Meanwhile, the widespread Q-Tobin indicator seems to be not so adequate in explaining the transformation of the intellectual capital inputs in the company's value even in developed markets.
- A validity of intellectual capital proxy indicators use was proved. Specifically, we could obtain the information on some company's internal factors of knowledge management using publicly available data. Many of the selected indicators showed high significance in the specified models and are obviously interpreted in terms of theory and practice of knowledge management.
- Some significant internal and external factors of the intellectual capital transformation were identified. For instance: company age, country (especially, Russia and European countries), and industry. Significant differences between developed and developing markets were found out. The relational and human capital showed higher significance in developed countries, while in Russia the structural characteristics present a growing point in most of corporations.
- However, the impact of some indicators on the company's performance is not so observable. For example, a negative correlation between R&D expenses and value added has been discovered in Russia. This phenomenon could be explained by higher risk of this investment and lower protection of intellectual property in Russia.
- Higher complementarity of the intellectual capital components should be noticed. Moreover, the combinations of interconnected elements are different for Russia and Europe. That could be also explained by different level of these components' significance in the analyzed markets.
- We can conclude that our results require further thorough analysis. For example, we need to assume a possible regressors' endogeneity, as well as consider the lagged nature of some intellectual capital inputs and outcomes. However, we have obtained certain preliminary results that could be used for knowledge management design and implementation.

Therefore the goal of this research step was reached. We had confirmed that intellectual capital could be analyzed on companies and industries levels. We realize that the statistical tools used in this paper are not sophisticated enough. We need to use advanced methods like panel data analysis as well as instrumental variables to solve endogeneity problem. Despite a number of the shortcomings of this research we have revealed some relevant and interesting issues that expected to be studied hereafter.

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