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Elena Shakina[a] & Angel Barajas[bc]
[a] National Research University Higher School of Economics, Lebedeva, 27, 614070 Perm, Russia
[b] Facultad de Ciencias Empresariales y Turismo, Universidad de Vigo, Campus Universitario, 32004, Ourense, Spain
[c] National Research University Higher School of Economics, Lebedeva, 27, 614070, Perm, Russia
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Elena Shakina[a]* and Angel Barajas[b,c]

[a]*National Research University Higher School of Economics, Lebedeva, 27, 614070 Perm, Russia;* [b]*Facultad de Ciencias Empresariales y Turismo, Universidad de Vigo, Campus Universitario, 32004, Ourense, Spain;* [c]*National Research University Higher School of Economics, Lebedeva, 27, 614070, Perm, Russia*

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This study investigates factors of corporate success over the crisis period of 2008–2009. We advocate the idea that investments in intangibles allow a company to be better off, even if the markets go down. The hypothesis put forward in this article was tested on a sample of more than 300 companies which operate in developed and emerging European markets, and belong to traditional and innovative industries. The application of statistical tools showed a robust significant link between the companies' investment decisions and their performance before and during the crisis. This study contributes to empirical corporate finance as it provides evidence that investment restriction is not the best response to an economic recession.

Keywords: value creation; crisis; intellectual capital; intangibles; intellectual resources

JEL classification: L20, L25, M21, J24, O34.

1. Introduction

This article investigates how the economic crisis influences the transformation of companies' intellectual capital. Numerous companies lost value during the economic recession of 2008–2009. Despite the overall negative impact of the crisis, some companies profited during the market turbulence. We would like to provide some insight into the changes in the success factors of companies related to their intellectual capital during the economic crisis. The research question addressed in this article is of particular importance in understanding the principal cause of the protracted economic recession, as well as the crisis aftershocks which are observable even today.

As a result of our analysis we hope to encourage discussion about the best responses of companies to the constraints of financial and consumer markets. This problem is not an abstract one; during crisis periods companies often look for ways to decrease their expenses. For that reason many companies in 2008–2009 cut their staff in non-operational departments, including marketing and human resources (HR) departments, reduced investments in research and development (R&D) and decreased salaries and training costs. Most of these costs are related to intellectual capital.

The reduction of costs allowed these companies to survive in difficult economic conditions whilst, at the same time, these measures deprived the companies of many

*Corresponding author. Email: eshakina@hse.ru.

of their strategic competitive advantages. As a result, a number of companies which chose a restrictive investment policy failed during and after the crisis. However, some businesses decided to take a risk over this period by increasing their investments in order to benefit during the market turbulence. Many of them failed as well, but those companies that succeeded present extraordinary results today.

As different outcomes of investments in intellectual resources are observed, we propose key factors affecting the levels of success during the crisis period. The low rate of successful strategies in marketing, HR and R&D in the 2008–2009 period can be explained by the lack of available information about the potential effectiveness of these investments in a crisis period. We assume that if companies were more aware of the beneficial effects of good knowledge management during market instability, a number of problems could be avoided.

For that reason, we examine key factors related to successful intellectual capital management. Jones, Jones, and Little (2000) study the crisis at the end of the 1990s. These authors highlight the importance of corporate goodwill as a buffer against losses during the economic turbulence. The global crisis of 2008–2009 and the role of intangibles are studied in Zaleha, Muhd-Kamil, Jagjit, and Hamezah (2008), Beltratti and Stulz (2009) and Lee, Beamish, Lee, and Park (2009). The value of intangibles during the recovery period after the economic crisis is shown in Aiginger (2010), using value creation as a criterion for a company' success. Most of the experts in empirical corporate finance insist on the fact that value is an important aim for any company in any economic condition. Our research contributes to this field by using a value-based concept and introducing an empirical analysis of markets that were severely affected during the crisis of 2008–2009. As stated by Kindleberger (1988), despite a number of unique features of crises all of them have similarities and result in nearly same outcomes. We expect that our study would be relevant for the companies during any future recession they might face.

The article is organised as follows: the next section gives a brief overview of the literature focusing mostly on empirical analysis of the transformation of intellectual capital into value. Section 3 describes our research design and the framework applied to our study and section 4 explains the methodology. The last two sections conclude the paper by briefly summarising the main findings obtained and also providing a discussion of the results.

2. Literature review

The influence of intangibles on performance has been investigated in recent years from different perspectives. Delios and Beamish (2001) examine the influences that intangible assets and experience have on profitability. Huang, Ou, Chen, and Lin (2006) study the association between IT investment – which can be considered part of the intellectual capital of the company – and performance. Carmeli and Tishler (2004) focus on the influence of intangible organisational elements on organisational performance. Carmeli and Azeroual (2009) analyse how intra-unit and inter-unit relational capital enable units to build knowledge combination capabilities and how such capabilities affect their performance. Surroca, Tribó, and Waddock (2010) study intangibles effecting social responsibility on financial performance and they find that there is only an indirect relationship between corporate responsibility and financial performance which relies on the mediating effect of intangible resources. Ittner (2008) illustrates the limitations in the studies that find evidence that intangible asset measurement is associated with higher

performance. Nold (2012) identifies a link between performance and knowledge management, organisational learning and knowledge creation. Jayasingam, Ansari, Ramayah, and Jantan (2012) provide empirical evidence to support the link between knowledge management practices and performance outcomes for organisations. Palte, Hertlein, Smolnik, and Riempp (2011) demonstrate that there is a positive relationship between knowledge management strategies and the performance of knowledge management processes. Nieves and Osorio (2012) explore how different types of networks influence innovative performance. Different dimensions of social capital within an organisation are examined by Weede and Kämpf (2002) and Sabatini (2008).

There are studies that address the impact of financial crisis on accounting in general. Ezzamel and Bourn (1990) analyse the roles of Accounting Information Systems in organisations facing financial crises. Arnold (2009) points out that the accounting practices are deeply implicated in the financial crisis. Magnan (2009) discusses some implications that can be drawn from the crisis about the merits and risks underlying fair value accounting. The crisis has led to a revision of accounting concepts, methods and tool. However, despite the relevance of the problem addressed in this paper, it is underdeveloped in the literature yet. Most of the studies that cover intellectual capital issues do not address the crisis impact problem. Nevertheless, it is valuable to obtain a picture of the changes in knowledge management caused by the world economic recession during 2008–2009.

A considerable number of the relevant papers apply the value-based view to identify intellectual capital efficiency. For instance, Riahi-Belkaoui (2003) applies the term 'relative value added' to identify intellectual capital outcomes; Orens, Aerts, and Lybaert (2009) use 'Tobin's Q' for this purpose. Meanwhile, there is a rich body of literature that utilise the terms Economic Value Added© (EVA©) and Market Value Added© (MVA ©) as proxy indicators of the return on intangibles.

The value-based management approach provides a whole set of tools for the evaluation of the effective use of intangibles resources. Most of them are related to the concept of economic profit which expresses the residual income, i.e. 'profit above a normal rate of return' (Zaratiegui, 2002). This means that if we consider intellectual capital outcomes, we need to analyse not only the returns of a particular firm but also opportunity costs expressed in the average rate of the return in the economy or the industry.

Much research into stakeholder theory agrees that economic profit reflects the efficiency of intellectual capital employment (Donaldson & Preston, 1995; Meek & Sidney, 1998). This concept implies that the company succeeds when returns on invested capital exceed the industry average. In a situation where many of the technologies and financial resources are generally available for all companies around the world, they should look for another source of growth. It is a way of beating the market and it could be provided by utilising intellectual capital and managing it effectively (Bontis, 2001; Chang, 2007). This reasoning underlies the assumption that economic profit stems from intellectual capital.

Economic profit can be expressed by different performance indicators: SVA© – shareholders' value added (Rappaport, 1986) EVA© – economic value added (Stern, 2001) CVA – cash value added (Ottoson & Weissenrieder, 1996) and many others. They are used as indicators of intellectual capital outcomes. We will mostly deal with the EVA© model since it is very widespread and can be used to make estimations based on the data used in financial statements. EVA© provides an evaluation of a company reflecting an increase in enterprise value over a period. This interpretation of EVA© means that this indicator explains the difference between the enterprise market value

and the book value of its assets. Capitalising EVA©, we obtain an estimation of market value added – MVA. In this sense, the MVA indicator collects the long-term effects of the intellectual capital outcomes.

According to Murthy and Mouritsen (2011), empirical investigation of the intellectual capital impact on shareholder value is of great importance. Garcia-Nogueira, Kimura, Junior, and Basso (2010) provide insight into the cohesion of intangibles and the EVA© of Listed Brazilian Companies. Baiburina and Golovko (2008) undertake an analysis of Russian companies during 2002–2006 and find that an excess of market value above book value is explained by intellectual capital accumulation. Liang, Huang, and Lin (2011) affirm that the association between proxies for intellectual capital and corporate value is positively and significantly interdependent in Taiwanese enterprises. On the other hand, De Santis and Giuliani (2013) and (Giuliani, 2013) remark the existence of intellectual liabilities.

Most of the above mentioned research attempts to capture the unforeseen results of intellectual capital transformation into company value. It is worth noting that a certain amount of contradiction is observed, both in the evidence and their interpretations. We suppose that this phenomenon occurs as a result of the strong time sensitivity of intangible efficiency. In analysing different periods and time horizons, these authors face the problem of changing market and economic conditions. This is particularly significant for emerging economies which includes Brazil, Russia and Taiwan. Moreover, the enormous market fluctuations emerging in crisis conditions can have the same impact on developed economies. In our research we would like to check this assumption. So, we observe markets before and during the economic crisis in order to find out if these changes lead to intellectual role transformation.

For the purpose of our study, we have taken as a reference the definition of intellectual capital based on a slightly modified concept proposed by Kristandl and Bontis (2007). This approach highlights the relationship between intangibles and value creation. Intellectual capital is a portfolio of strategic resources that enable an organisation to create sustainable value. They are not available to a large number of firms (rarity). They lead to potential future benefits, which cannot be taken by others (appropriability), and are not imitable by competitors, or substitutable using other resources. They are not tradeable or transferable on factor markets (immobility) due to corporate control. Because of their intangible nature, they are non-physical, non-financial, are not included in financial statements, and have a finite life (Kristandl & Bontis, 2007; 1518–1519).

A variety of options about the composition of intellectual capital have been proposed and reasoned, including two three, four and five components structures. We follow the approach suggested by Stewart (2010) who identifies three components of the intellectual capital: human (HC), relational (RC) and structural resources (SC).

3. Research design

Relevant studies like those by Chang (2007) Huang and Wang (2008), Baiburina and Golovko (2008), Diez et al. (2010), Garcia-Nogueira et al. (2010), Zeghal and Maaloul (2010), Liang et al. (2011) or Maditinos, Chatzoudes, Tsairidis, and Theriou (2011) put the emphasis on value creation. The key advantage of this criterion is that it represents the main purpose of strategic investors. We do not consider it essential to cover all the intangibles of the companies in our analysis, since the focus of this research is related to the value drivers in intellectual resources, which change across different economic conditions, namely economic prosperity and stagnation. Thus, we place the emphasis

only on those intellectual resources that we find to be of particular significance for turbulent market conditions. These factors are shown in Figure 1. This approach enables us to design a model based on a number of observable and comparable proxy indicators of intangibles.

The hypotheses put forward (see Figure 2) in this research combine our understanding of the relevant issues of the crisis impact as well as the results of previous studies. Many empirical studies have captured the statistical significance of structural capital (see for example Bontis, 2001; Chang, 2007; Chen, Cheng, & Hwang, 2005; Choudhury, 2010; Firer & Williams, 2003; Huang & Hsueh, 2007; Poletti Lau, 2003) The same studies collated results on relational capital outcomes. We propose that this resource could be equally important for companies before and during the crisis. The last hypothesis in our research is related to human capital relevance and is based on the contradictory results established in previous studies. For instance, Baiburina and Golovko (2008) revealed the robust statistical significance of 'employee training costs' and the 'presence of controlling owner' for company value. The same justification is provided by Baxtera and Matear (2004), as well as Maditinos et al. (2011). In contrast, Majid and Lodhi (2009) failed to corelate human capital cohesion with company performance. This finding was also repeated by Garcia-Nogueira et al. (2010). The key suppositions of our research are presented below in Figure 1, where the components of Intellectual Capital (SC, RC and HC) are represented along with the external factors (belonging to an industry or country) and the influence of the crisis in the creation of value in companies.

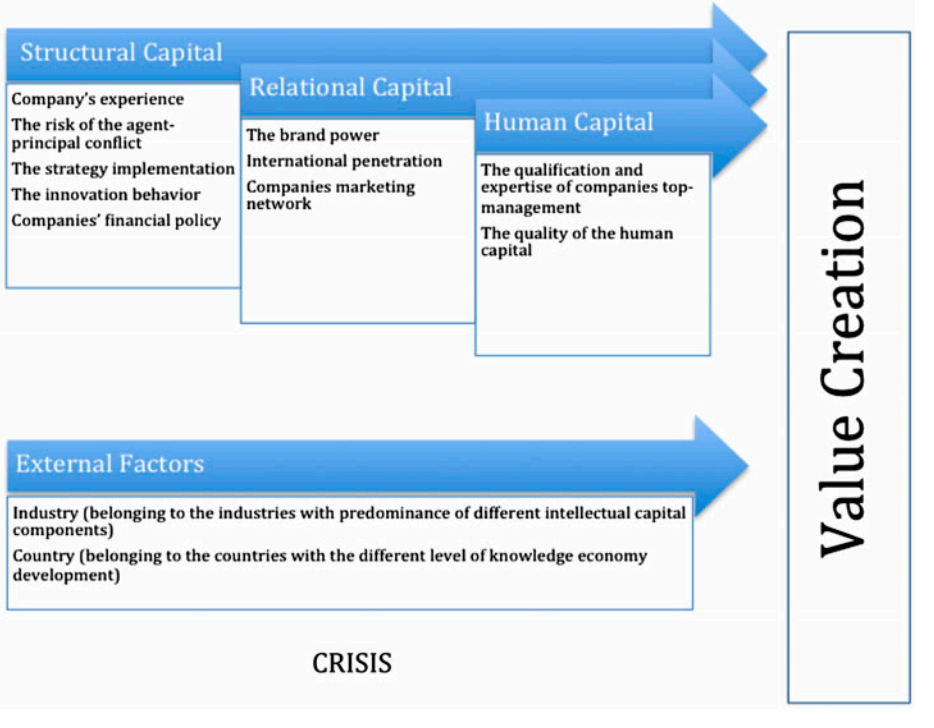

Figure 1. The framework of the research design.
Source: Designed by the authors.

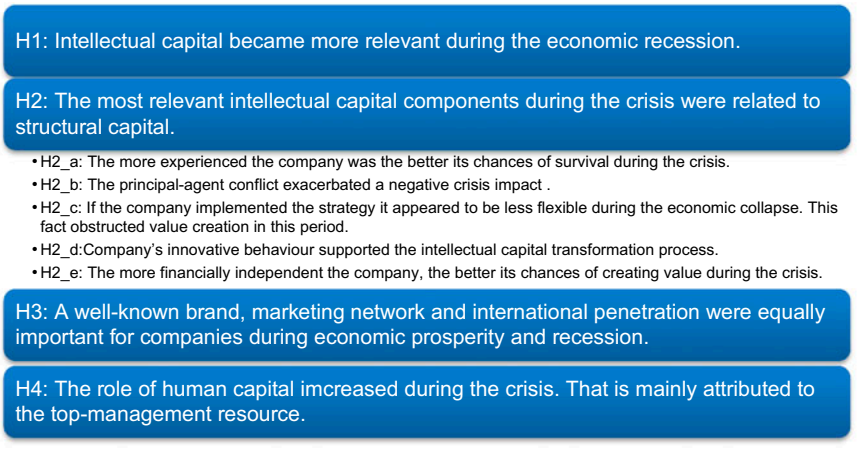

Figure 2. Hypotheses related to the changing role of intellectual capital value drivers over the crisis.
Source: Designed by the authors.

To obtain an accurate picture of the success factors of companies related to their intangibles before and during the crisis we organise the analysis of the same companies into four panels (one for each year) in the following two periods:

- 2006 and 2007 – economic prosperity
- 2008 and 2009 – economic recession.

As has already been mentioned, we need to validate our approach by using a number of proxy indicators associated with intellectual resources, as well as the external factors which might influence company value creation.

To test the hypotheses (see Figure 2) we have used a system of proxy indicators. We realise that the use of proxies in our research is debatable. The nature of intangibles is difficult to capture and express through quantitative indicators. Nevertheless, our analysis requires this kind of approximation. To deal with this requirement we have surveyed the empirical studies related to the topic. Then, we have included in our investigation those indicators that can be estimated using publicly available information. Table 1 summarised the indicators employed in this article. We have looked for those that appear to cover the following two features of intangibles as a part of company assets (capital): the volume of investments associated with a particular resource and the quality of this resource. For instance, 'employee expenses' and 'number of employees' reflect the volume of investments in human capital. 'Board of director qualifications' has a positive correlation with the quality of the staff hired (Shrader & Siegel, 2007; and Ugboro & Obeng, 2000). Thus, by including the last proxy in our model, we assess the quality of all HRs involved in a company's activities.

Structural capital is the most heterogeneous intangible resource of a company. Following the idea of the evaluation of the quality and quantity of the resources in our system of proxies, we have included in our model those indicators that reflect the value drivers that presumably change over the crisis. For example, according to our suppositions:

Table 1. Proxy-indicators for intellectual resources.

Components	Factors in the frame of IC likely to be sensitive to changes to external conditions	Intellectual capital proxy indicators	Authors that mention the same or similar proxy indicators	Information source and estimation algorithm
Intellectual capital outcome: Value creation	The fact of the creation or the destruction of the value	Economic Value Added (EVA©)	Riahi-Belkaoui (2003) Garcia-Nogueira et al. (2010) Pal et al. (2009) Shakina and Barajas (2012)	$\mathbf{EVA_t=IC_{t-1}*(ROIC_t-WACC_t)^2}$
Human capital	The quality of the human capital The qualification and expertise of companies top-management	Employee expenses	Hagg and Scheutz (2006) Baiburina and Golovko (2008) Orens et al. (2009)	Company's Annual Report*, section 'Financial data' Employee costs divided to total costs
		Number of employees	Huang and Liu (2005) Huang and Wang (2008) Baiburina and Golovko (2008) Garcia-Nogueira et al. (2010) Huang and Wu (2010)	Company's Annual Report, section 'Common information'
		Board of directors qualification	Ugboro and Obeng (2000) Tseng and Goo (2005) Shrader and Siegel (2007) Orens et al. (2009) Kamukama, (2010) Shakina and Barajas (2012)	Company's Annual Report, section 'Directors information'. If more than one third of directors have postgraduate level of qualification and more than 5 years of experience (2 points). If more than one third of directors have postgraduate level of qualification or more than 5 years of experience:1 point. Another: 0.

(*Continued*)

Table 1. (*Continued*).

Components	Factors in the frame of IC likely to be sensitive to changes to external conditions	Intellectual capital proxy indicators	Authors that mention the same or similar proxy indicators	Information source and estimation algorithm
Structural Capital	The innovation behaviour	R&D investments	Poletti Lau (2003) Gleason and Klock (2003) Sellers-Rubio et al. (2007) Huang and Wang (2008) Huang and Liu (2005)	Company's Annual Report, section 'Financial data'
		Number of patents, licences, trademarks	Tseng and Goo (2005) Sellers-Rubio et al. (2007) Shakina and Barajas (2012)	Search on company's name and number of patents on the website QPAT: http://www.orbit.com.
		Book value of Intangible assets	Sellers-Rubio et al. (2007) Shakina and Barajas (2012)	Company's Annual Report, section 'Financial data'
	The strategy implementation	Strategy implementation	Tseng and Goo (2005) Kamukama (2010)	Company's website
		ERP, quality management systems implementation	Shakina and Barajas (2012) Kamukama (2010) Murthy and Mouritsen (2011) Shakina and Barajas (2012)	• Search on company's location on their website using the following words as «ERP», «Oracle», «NAVISION», «NAV», «SQL», «SAP» • If the company has news about these things: 1 point, otherwise: 0 points. Important to put '1' or '0' in the year of start implementation
	Company's experience	Company's experience/age	Huang and Wang (2008)	Company's Annual Report, section 'Common information'

	Companies' financial policy	Financial leverage	Poletti Lau (2003) Riahi-Belkaoui (2003) Huang and Liu (2005) Liang et al. (2011)	Company's Annual Report, section 'Financial data'Estimation: Long term debts divided to Equity
	Risk of the principal – agent conflict	Owners/directors ratio	Himmelberg et al. (1999) Durand and Vargas (2003) Bruton et al. (2010) Liang et al. (2011) Shakina and Barajas (2012)	Company's Annual Report*, sections 'Shareholder name' and 'Directors information'
Relational capital	Brand power	Well-known brand	Riahi-Belkaoui (2003) Hagg and Scheutz (2006) Murthy and Mouritsen, (2011) Shakina and Barajas (2012)	Search on company's name on the website: http://www.justmeans.com/top-global-1,000-companies. If it has a rank: 1 point, otherwise: 0 point.
	International penetration	Foreign capital employed	Shakina and Barajas (2012)	Company's Annual Report, Section 'Shareholder name', vertical vector 'country'. If company has foreign investors it gained 1 point, and otherwise 0 points
	Brand power, Company's marketing network	Citations in search engines	Shakina and Barajas (2012)	Search on company's name and its score on the website: http://www.prchecker.info/check_page_rank.php
	Company's marketing network	Presence of subsidiaries	Shakina and Barajas (2012)	Company's Annual Report, section «Subsidiary name». If company has less than 100 subsidiaries put the total number, otherwise use the following vector «First 100 out of Y subsidiaries».
	Company's marketing network	Commercial expenses share	Gleason and Klock (2003) Huang and Wang (2008) Garcia-Nogueira et al. (2010)	Company's Annual Report, section 'Financial data'Estimation: Commercial expenses divided to Total costs

(*Continued*)

Table 1. (*Continued*).

Components	Factors in the frame of IC likely to be sensitive to changes to external conditions	Intellectual capital proxy indicators	Authors that mention the same or similar proxy indicators	Information source and estimation algorithm
External factors of intellectual capital transformation	Belonging to a particular industry	Industry	Huang and Liu (2005) Swartz and Firer (2005) Orens et al. (2009) Shakina and Barajas (2012)	Company's Annual Report, section 'Common information', The main activity.
	Belonging to a particular country	Knowledge Economy Index	Shakina and Barajas (2012)	Search on company's location on the website: http://data.worldbank.org/data-catalogue/KEI

[2]Where:
$IC_{t-1} = D_t+E_t$: Book Value of Equity and Debts.
$ROIC_t=NOPAT_t/IC_{t-1}$: Return on invested capital.
$NOPAT_t=EBIT_t(1-T)$: net operation profit after taxes.
$WACC_t=D_t/(D_t+E_t)*kd(1-T)+ E_t/(D_t+E_t)*ke$: Weighted average cost of capital.
D_t: Book value of debt.
E_t: Book value of equity.
kd=krf+default spread of the company+default spread of the country: Cost of debt.
ke=krf+β*(km-krf): Cost of Equity.
krf: Risk free rate – return on the Treasury bonds of USA Government.
β: bottom-up build beta (adjusted by Hamada's equation).
km: Historical return on the market portfolio (market index).
T: effective tax rate.
For our study we used the annual reports from the Amadeus database provided by Bureau Van Dijk (http://www.bvdep.com/be-nl/amadeus.html).
Source: authors' own elaboration.

- The experience of a company is assessed by its age.
- The probability of principal-agent conflict rises with the decreasing involvement of the investors (shareholders) in corporate management. It is assumed that when more shareholders are represented in company management, they are more concerted in the decision-making process. This phenomenon was examined by Himmelberg, Hubbarda, and Paliaa (1999), Durand and Vargas (2003) and Bruton, Filatotchev, Chahine, and Wrigh (2010). This factor is likely to be related to the companies' structural capital as it reflects the shape of its corporate strategy and financial policy and has systematic impact on company activities.
- The existence of ERP and quality management systems together with the introduction of the company's strategy on its website reflects the fact that company implements its corporate strategy.
- R&D investments and intangible asset can be interpreted as a reflection of the innovative behaviour of companies.
- The financial leverage reflects the companies' financial policy: whether it borrows or uses the owner's capital.

Turning to relational capital, we put the emphasis on the company's relations with customers, suppliers, and investors. We also seek to consider the international relations of the company. Among the proxy indicators introduced in the frame of the relational capital we include:

- The presence of subsidiaries as a proxy for the marketing network of the company.
- Commercial expenses as an indicator that reflects the volume of investment in relational resources and that evaluates the company's marketing networking.
- A well-known brand approximates the quality of the company's relational capital in the frame of relations with clients.
- Foreign capital employed explores the international penetration and dependence of the company on international partnerships.
- Citations in search engines provide the information about the company's presence on the Internet.

In our analysis we seek to provide a sufficient empirical base by using only those proxy indicators, which can be estimated using publicly available information. Most of these indicators were found in the relevant empirical studies that cover the topics that we are studying. Moreover, some of those proxies are presented in the practical application of the intellectual capital management – Sveiby Monitor (Sveiby, 2005), Balanced Score Card designed by Kaplan and Norton (1996 and 2000). The procedure that allows us to estimate the value of each proxy was developed on the basis of the information available: patent bureau information, international rankings, company sites, search engines and others.

4. Methodology

We investigate companies from European countries (Great Britain, Germany, Spain, Netherlands, Finland, Serbia, Portugal, Ukraine and Turkey). These countries were selected according to their position in the Knowledge Economy Index-based (KEI) ranking (2009) designed by World Bank[1]. All these countries belong to the group

Europe and Central Asia. They represent nine out of the 46 countries in that group and we looked for countries with different degree of intensity on the use of intangibles.

The datasets in this study were derived from a combination of several detailed longitudinal databases (Amadeus and Ruslana). The database collected for the purpose of this study consists of financial and economic indicators underlying intellectual capital evaluation, for instance, EVA© as a proxy of intellectual capital annual return. As we emphasise the external factors of intellectual capital transformation, the database includes a number of indicators related to those factors.

The data-set includes figures from annual statistical and financial reports, but it also contains different qualitative characteristics. We have collected data from about 300 European companies. The final sample is an unbalanced panel for the period from 2006 to 2009 with 313, 322, 338 and 356 companies respectively. We have used the following criteria to decide if a particular company should be in the database:

- The company should employ no less than 50 and no more than 20,000 people
- The company should be a public company.

Table 2 characterises the type of the company and the time period of the research. It presents several descriptive values for the sample, where the mean and the standard deviation of the variables are detailed.

We have analysed companies from various industries, which differ in a number of criteria such as concentration, value chain type, financial architecture and dynamic of the knowledge obsolescence. We have selected the following industries: financial services, wholesale and retail trade, machinery and equipment manufacture, chemicals and oil, and transport and communications. ANOVA allows us at least not to reject our proposition with regard to the significant differences between industries (F = 4.75***; chi2(6) = 2,500***). The country factor is also significant (F = 2.6**; chi2(6) = 1,800***). Nevertheless, these conclusions are drawn on the basis of rough estimations.

Table 2. Key descriptive statistics of the sub-samples (million dollars).

Variable	Year	Number of observations	Mean value	Standard Deviation	Min	Max
EVA©	2006	240	−19.74	169.46	−1,627.78	1,762.43
	2007	256	−36.13	192.17	−2,699.10	869.67
	2008	271	−66.00	313.55	−4,331.47	1,403.26
	2009	255	−96.44	591.28	−8,799.05	216.18
Company's experience/age	2006	290	35.61	32.93	0.00	142.00
	2007	295	35.95	32.83	0.00	143.00
	2008	300	36.93	33.22	0.00	144.00
	2009	304	37.05	33.00	0.00	145.00
Number of employees	2006	295	4,244	4,083	514	19,580
	2007	303	4,351	4,171	512	18,717
	2008	307	4,347	4,279	508	18,767
	2009	312	4,087	4,205	501	19,302
Intangible assets	2006	297	132.19	368.50	0.00	4,317.99
	2007	303	185.30	490.10	0.00	4,051.95
	2008	307	192.99	510.34	0.00	4,326.16
	2009	312	216.14	648.73	0.00	6,627.11

Source: authors' own elaboration.

To validate this, we need to look at our data more precisely by running a regression analysis.

We analyse industry and country differences, supposing that these factors play critical roles in the intellectual capital transformation process, which undoubtedly has an impact on strategic investors' expectations.

According to the concept developed by Stern (2001), 'EVA© is calculated as the difference between the Net Operating Profit After Tax (NOPAT) and the opportunity cost of Invested Capital (IC*WACC)'.

To obtain an accurate picture of companies' performance represented in our sample, we have analysed the changes in values over the period 2006–2009. This information is shown in Table 3. The number of companies with positive EVA© falls from 2006 to 2009. The EVA© on average becomes more negative. That confirms our supposition with regard to the strong negative impact of the crisis on companies.

The primary focus of this research is value creation rather than the amount of the contribution to the value. We develop a model with binary outcomes where positive EVA© is associated with value creation and negative EVA© with value destruction. We estimate a logit model using the Maximum Likelihood (ML) tool.

The dependent variable of our model specification is the probability of creating or destroying value. We decided to move from the initial variable EVA© to its dummy expression because that transformation will decrease the influence of endogeneity. The probability of value creation is unlikely to have great reverse causality on companies' intangibles. That also helps to avoid size effect. We have used the appropriate estimator – logit regression. All the results of the estimation are interpreted by taking into account the specific sense of the dependent variable.

Our econometric specification is as follows:

$$P_i E(Y = 1|X_i) = \frac{1}{1 + exp\{-\beta \cdot X_i\}} \quad (1)$$

Y – the dummy for value creation (explanatory variable)

X_i– the proxies for companies' intangibles and external factors of intellectual capital transformation.

5. Results

Table 4 shows the results of our examination of the data for the four sub-samples and the estimations of panels. We have already mentioned that the 1st and 2nd panels reflect

Table 3. Analysis of companies that created or destroyed values during the period (million dollars).

	Creating value		Destroying value	
Year	Number of companies	Mean positive EVA©	Number of companies	Mean negative EVA©
2006	67	40.85	173	−42.74
2007	58	35.18	198	−55.49
2008	40	52.78	231	−83.99
2009	36	24.46	219	−111.19

Source: authors' own elaboration.

Table 4. Results of the regression estimation.

Tests	Panel 1 2006	Panel 2 2007	Panel 3 2008	Panel 4 2009
Hypothesis 1				
Pseudo R-squared	0.131	0.117	0.137	0.264
Log pseudolikelihood	−111.342	−110.258	−86.595	−65.049
Wald chi2(18)	29.13*	33.33**	31.20**	38.70***
Intercept	−7.779	−4.203	−4.202	−4.641
	(1.950)	(1.712)	(1.891)	(2.246)
Number of observations (Groups)	212	224	224	213
Independent variables/factors of intellectual capital	Panel 1 2006	Panel 2 2007	Panel 3 2008	Panel 4 2009
Hypothesis 2				
Company's experience	−.0131**	−.0168***	−.013*	−.008
	(.005)	(.006)	(.007)	(.008)
Owners/directors ratio	−.333	.544	1.214*	−.110
	(.842)	(.763)	(.745)	(1.035)
Strategy implementation	−.239	.406	.375	.298
	(.452)	(.454)	(.524)	(.868)
ERP, quality management systems implementation	−.545	−.982**	.048	−1.876 ***
	(.436)	(.476)	(.529)	(.676)
R&D investments	.004	−.0002	−.021*	−.037***
	(.012)	(.013)	(.011)	(.013)
Number of patents, licences, trademarks	.002	.003	.006***	−.002
	(.002)	(.003)	(.002)	(.003)
Book value of Intangible assets	−.0002	.0004	−.0003	−.0003
	(.0006)	(.0004)	(.0005)	(.0004)
Financial leverage	.041	−.013	−.177	−.342
	(.066)	(.117)	(.271)	(.272)
Hypothesis 3				
Well-known brand	1.567	.852	1.060*	1.888**
	(.735)	(.717)	(.586)	(.764)
Foreign capital employed	−.074	.202	.310	−.177
	(.522)	(.526)	(.647)	(.575)

Citations in search engines	−.085	−.109	.184	−.456***
	(.117)	(.102)	(.135)	(.169)
Presence of subsidiaries	−.0003	−.002	−.00,005	−.028 **
	(.002)	(.002)	(.002)	(.0138)
Commercial expenses share	.204	.004	.969	1.903
	(1.088)	(.989)	(.993)	(1.297)
Hypothesis 4				
Employee expenses	−.0002	.0002	.00001	.004
	(.002)	(.002)	(.002)	(.003)
Number of employees	.00001	−00001	.00,004	.00001
	(.00006)	(.00006)	(.00008)	(.0002)
Board of directors qualification	.0247	−.518	−1.044*	1.677***
	(.454)	(.454)	(.565)	(.585)
Control variables				
Company is a manufacturer	.494	.414	.269	−.886
	(.494)	(.512)	(.677)	(.852)
Company is in the oil industry	dropped	1.270	dropped	−2.596**
		(.842)		(1.173)
It is a trading company	.206	−.010	−.456	−.967*
	(.427)	(.452)	(.582)	(.599)
Knowledge Economy Index	.894***	.446**	.183	.593**
	(.265)	(.228)	(.235)	(.311)

Source: authors' own elaboration.
Notes:.
*Significant at p<0.1.
**Significant at p<0.05.
***Significant at p<0.001.

the period of economic prosperity, while the 3rd and 4th respond mainly to the global economic crisis. Our study shows that there is a robust relationship between intellectual capital components and company performance expressed in value creation. However, the strength of this link, as expected, is different for the same enterprises before and during the economic recession.

The explanatory power of the model (Pseudo R^2) and their significance (Wald chi^2) show the validity of the first hypothesis. Intellectual capital played a more critical role in value creation during the crisis. Our investigation revealed that the economic recession appears to change the priorities of companies with regards to intangibles. To be better off companies should mainly enhance human and relational capital. In contradiction to our preliminary supposition, capital-intensive structural resources like R&D, as well as ERP system development, could be obstacles during a crisis. This finding contradicts the studies by Poletti (2003) and Chang and Hsieh (2011). The amount of experience of an individual company seems to be important only under sustained economic growth. Notably, that according to our exploration, younger companies appear to be more competitive during the economic prosperity. The findings look different when we analyse crisis conditions. More matured companies probably were taking advantage of their experience. We established that this factor was no more significant during turbulent economic times. According to our findings, the principal-agent problem has a negative impact only at the beginning of the crisis. We did not find any evidence that strategy implementation obstructed company responses to the economic collapse. This evidence corresponds to results obtained by Bowman and Helfat (2001). One of the most unexpected results of our research is the apparent irrelevance of the company's financial independence in value creation before, as well as during, the economic recession. This fact deserves particular attention as there were many intense debates surrounding this issue in 2008–2009.

We can only partly confirm the hypothesis concerning the influence of the marketing of intangibles on a company's value. We found that a well-known brand takes on the role of value driver only during economic turbulence. Thus, our results contradict Hagg and Scheutz (2006) who captured the persistent relevance of this intangible. Subsidiaries obstruct value creation during difficult conditions and at the same time they are irrelevant for companies during economic prosperity. Foreign capital employment is not important for success in either case. The last hypothesis is supported by our investigation. Human capital, as expected, was the most important resource for companies in a crisis. As revealed in our analysis the competence and expertise of top-management, which according to our assumption approximates the quality of human capital in a company, appeared to be considerable during economic turbulence. Moreover in the beginning of the crisis the return on high-qualified management was negative. This phenomenon might be explained as follows: obviously, the qualification of top-management is a very expensive resource for companies. The first response on it during the hard conditions was negative, but with not very significantly (on a 90% confidential level). The return on more qualified management was brought basically in 2009. Some previous research such as that by Huang and Hsueh (2007) and Garcia-Nogueira et al. (2010) established that human capital appears to be irrelevant during economic stability. That appears to be in line with our findings as this factor was not significant in 2006 and 2007.

In addition, we found a number of interesting facts concerning the factors affecting the transformation of intellectual capital into value. The oil industry in 2008 and 2009 suffered the most in comparison with other sectors represented in our analysis. This

phenomenon emerges as a result of a strong dependence of these companies on global market conditions, particularly on oil prices. The country factor according to our more precise estimates appears to be more considerable for market development over periods of prosperity.

6. Discussion and conclusion

In answering the questions addressed in our study and testing the hypotheses we would like to emphasise the following three points.

First, evidence for the changing role of intellectual capital is found. This finding corresponds to the idea that intangibles are of particular importance during market instability. Theoretical and empirical evidence are given in most of the studies mentioned in our article. Taking into account that intellectual resources provide most of the competitive advantages in the knowledge economy, this result is unsurprising. Human capital was a key factor for success during the economic recession of 2008–2009. It is mainly related to the qualifications and experience of the top-management. Senior management proved to be a necessary support in decision-making during the economic collapse. This appears to be more important than financial resource availability related to the structural capital, or, for example, customer loyalty associated with relational resources. Evidence for this value driver is found not only in our study, but also in those by Meek and Sidney (1998), Donaldson and Preston (1995), Riahi-Belkaoui (2003) and Orens et al. (2009). Meanwhile we try to avoid underestimating the importance of marketing and structural capital. We believe that there is a strong interconnection between all intellectual resources. A high quality of human capital enhances all the intangible resources related to a relational network, as well as companies' business processes as Baiburina and Golovko (2008), Baxtera and Matear (2004) and Maditinos et al. (2011) demonstrate.

Second, the relevance of a powerful brand as a part of a company's relational capital is established only for turbulent markets. We failed to find a statistical significance for the presence of a well-known brand during the economic prosperity of 2006–2007. We suppose that in a growing market, most companies create value. Marketing resources appear to be less important in such conditions in terms of marginal return. On the contrary, an economic recession is associated with strong competition. A powerful brand in this sense is apparently a key value driver. It allows a company to survive or even be better off during market turbulence.

Third, a number of factors that had been presumed as being relevant value drivers failed to find validation in our research. International penetration, financial policy and strategy implementation are among these. International penetration is associated with significant dependence on global market conditions, on the other hand it provides additional opportunities in terms of financial resources, as well as foreign marketing policy development. Nevertheless our results do not support this supposition. This factor appears to be statistically insignificant for periods of economic prosperity and recession. The same finding is true for companies' financial policy. A financial leverage is not considered as a key value driver across the economic growth of 2006–2007 and as an obstructer during the crisis in 2008–2009. This phenomenon occurs as an unforeseen result.

The intense debates surrounding the crisis, challenge at least two important causalities. The more dependent on external funds the company is, the greater the risk of failure during the economic collapse. An explicit financial strategy makes the company

rigid and does not allow it to react promptly and quickly to hard economic conditions. Our research does not provide evidence to support these suppositions.

External factors, such as industry and country, remain relevant for periods of economic prosperity and recession. However, the context of these factors impacts upon changes during the crisis as well. The oil industry, as expected, suffered more than other sectors. The ability to create value during the crisis decreased for trading companies as a result of restricted purchasing power.

The results of our study should be interpreted with a certain amount of caution, mainly because of the general lack of information involved in the analysis and the need of using proxy indicators that cannot reflect totally the elements that represent. New insights into the role of intellectual capital during the economic crisis, developed in our study, extend the understanding of the factor range which should be taken into account when making investment decisions.

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Note

1. http://data.worldbank.org/

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