The changing role of intellectual resources during the economic crisis of 2008-2009

Abstract

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 paper 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.

Key words: value creation, crisis, intellectual capital

Introduction

This paper investigates how a crisis influences the transformation of companies' intellectual capital. The problem is that 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 paper 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 HR departments, reduced investments in research and development, and decreased salaries and training costs. Most of these costs are related to intellectual capital.

Cost reduction allowed these companies to survive for a while in difficult economic conditions, while at the same time these measures deprived the companies of many 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, human resources (HR) and research and development (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 *et al.* (2000) consider the crisis at the end of nineties. The 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 *et al.* (2008), Beltratti & Stulz (2009) and Lee *et al.* (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 in the paper by Kindleberger (1988), despite a number of unique features of crises all of them have similarities and result in nearly same outcomes. We believe that our study expected to be relevant for the companies during future recession they might face.

The paper is organized 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. Section 4 empirically tests the hypotheses. The last two sections conclude the paper by briefly summarizing the main findings obtained and also providing a discussion of the results.

Literature Review

The influence of intangibles on performance has been investigated in recent years from different perspectives. Delios & Beamish (2001) examine the influences that intangible assets and experience have on profitability. Huang *et al.* (2006) study the association between IT investment – which can be considered part of the intellectual capital of the company - and performance. Carmeli & Tishler (2004) focus on the influence of intangible organizational elements on organizational performance. Carmeli & 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 *et al.* (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 a 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, organizational learning and knowledge creation. Jayasingam *et al.* (2012) provide empirical evidence to support the link between knowledge management practices and performance outcomes for organizations. Palte *et al.* (2011) demonstrate that there is a positive relationship between knowledge management strategies and the performance of knowledge management processes. Nieves & Osorio (2012) explore how different types of networks influence innovative performance. Different dimensions of social capital within an organization are examined in the paper by Weede & Kämpf (2002) and Sabatini (2008).

Despite the relevance of the problem addressed in this paper, it is as yet underdeveloped in the literature. 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 to 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 *et al.* (2009) use 'Tobin's Q' for this purpose. Meanwhile, there is a rich body of literature that utilize 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; economic profit expresses the residual income, i.e., "profit above a normal rate of return" (Zaratiegui, 2002) which 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 (Meek & Sidney, 1998; Donaldson & Preston, 1995). 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 utilizing 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 (Ottosson & 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. 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)" (Stern, 2001).

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. Capitalizing EVA© we obtain an estimation of market value added - MVA©. In this sense the MVA© indicator is related to the long-term proxies of the intellectual capital outcomes.

According to Murthy & Mouritsen (2011), an empirical investigation of the intellectual capital impact on shareholder value is of great importance. Nogueira *et al.* (2010) provide insight into the cohesion of intangibles and the EVA© of Listed Brazilian Companies. Baiburina & Golovko (2008) undertake an analysis of Russian companies during 2002-2006 and find as a result that an excess of market value above book value is explained by intellectual capital accumulation. Liang *et al.* (2011) affirm that the association between proxies for intellectual capital and corporate value is positively and significantly interdependent in Taiwanese enterprises.

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. We continue by

observing 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 Kristand and Bontis (2007). This approach highlights the cohesion between intangibles and value creation.

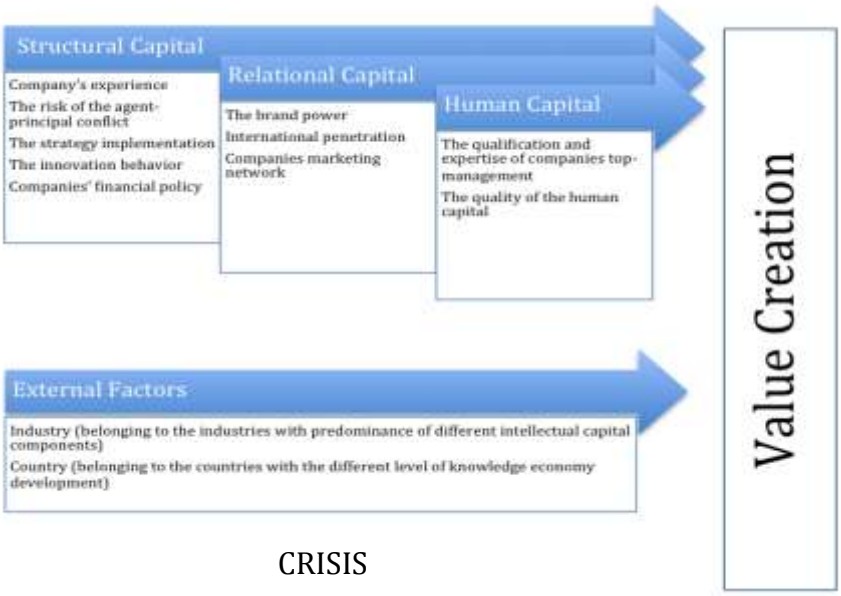
Intellectual capital is a portfolio of strategic resources that enable an organization to create sustainable value. They are not available to a large number of firms (rarity). They lead to potential future benefits, which cannot be taken by others (appropriability), and are not imitable by competitors, 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 (Kristand and Bontis, 2005; 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) which identified three components of the intellectual capital: human (HC), relational (RC) and structural resources (SC).

Research Design

The analysis of the empirical studies established a number of crisis-relevant issues in relation to intellectual capital investments. Moreover, relevant studies like those by Chang (2007) Huang & Wang (2008), Baiburina & Golovko (2008), Diez *et al.* (2010), Nogueira *et al.* (2010), Zeghal & Maaloul (2010), Liang *et al.* (2011) or Maditinos *et al.* (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.

Fig. 1. The framework of the research design

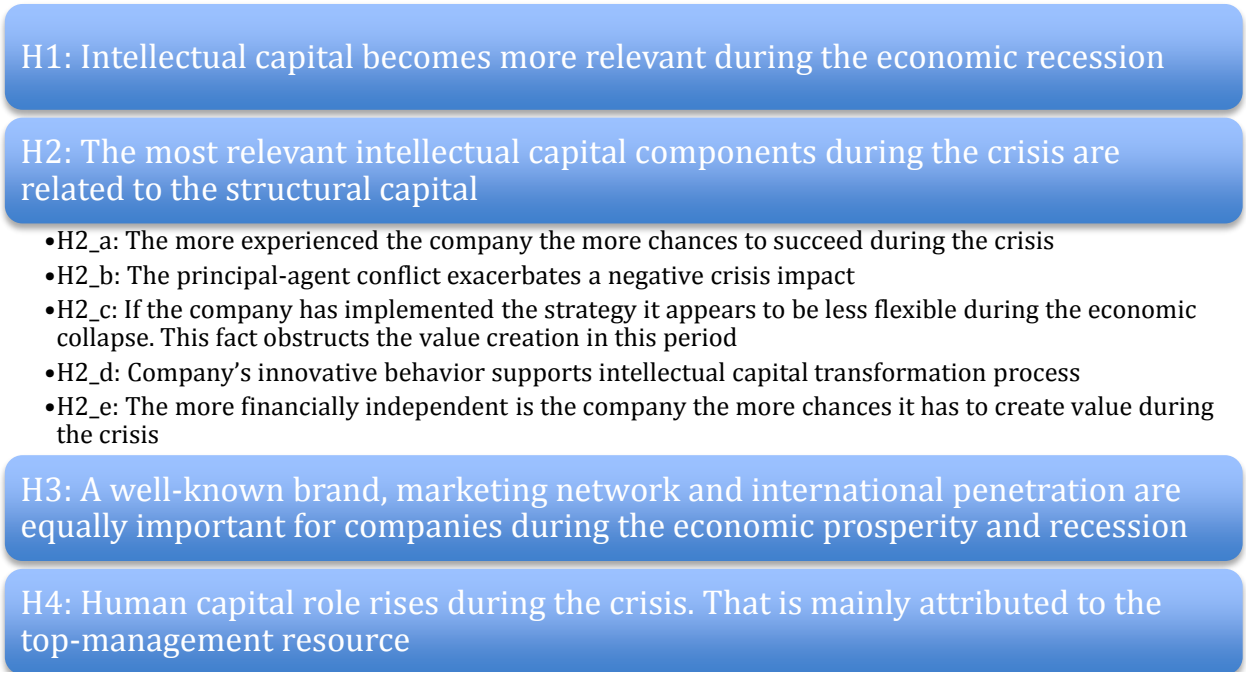


This approach enables us to design a model based on a number of observable and comparable proxy indicators of intangibles.

The hypotheses put forward 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 Firer & Williams, 2003; Poletti Lau, 2003; Bontis, 2001; Chang, 2007; Chen *et al.*, 2005; Choudhury, 2010; Huang & Hsueh, 2007) 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 & Golovko (2003) 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 & Matear (2004), as well as Maditinos *et al.* (2011). In contrast, Majid & Lodhi (2009) failed to corelate human capital cohesion with company performance. This finding was also repeated by Nogueira *et al.* (2010).

The key suppositions of our research are presented below in Figure 2.

Fig. 2. Hypotheses related to the changing role of intellectual capital value drivers over the crisis



To obtain an accurate picture of the success factors of companies related to their intangibles before and during the crisis we organize 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 estimate this equation we have used the system of proxy indicators presented in Table 1. We realize 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 included in our investigation those indicators that can be estimated using publicly available information. 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, as shown in the table 1, '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 (Ugboro & Obeng (2000) and Shrader & Siegel (2007)). Thus, by including the last proxy in our model, we assess the quality of all human resources involved in a company's activities.

Structural capital is the most heterogeneous intangible 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):

−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 et al (1999), Durand & Vargas (2003) and Bruton et al (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 value 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 evaluates 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.

We decided that the estimation of the factors introduced in the analysis has to be based on a unified measurement tool. With that in mind, we assume that any survey data collected are affected by the strong subjective impressions of those who are being interviewed. Meanwhile an investigation of publicly available information with a narrow expert group allows us to avoid this bias. Nevertheless, these data are restricted. 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 issues 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.

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 Mentioned 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) Nogueira *et al.* (2010) Pal *et al.* (2009) Shakina & Barajas (2012)	**$EVA_t=IC_{t-1}*(ROIC_t-WACC_t)$** [1]
Human Capital	The quality of the human capital The qualification and expertise of companies top-management	Employee expenses	Hagg & Scheutz (2006) Baiburina & Golovko (2008) Orens *et al.* (2009)	Company's Annual Report*, section "Financial data" Employee costs divided to total costs
		Number of employees	Huang & Liu (2005) Huang &Wang (2008) Baiburina & Golovko (2008) Nogueira *et al.* (2010) Huang & Wu (2010)	Company's Annual Report, section "Common information"
		Board of directors qualification	Ugboro & Obeng (2000) Tseng & Goo (2005) Shrader & Siegel (2007) Orens *et al.* (2009) Kamukama, (2010) Shakina & 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 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.

[1] 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

Structure Capital	The innovation behaviour	R&D investments	Poletti Lau (2003) Gleason & Klock (2003) Sellers-Rubio *et al.* (2007) Huang &Wang (2008) Huang & Liu (2005)	Company's Annual Report, section "Financial data"
		Patents, licenses, trademarks	Tseng & Goo (2005) Sellers-Rubio *et al.* (2007) Shakina & Barajas (2012)	Search on company's name and number of patents on the website QPAT: http://library.hse.ru/e-resources/e-resources.htm.
		Intangible assets	Sellers-Rubio *et al.* (2007) Shakina & Barajas (2012)	Company's Annual Report, section "Financial data"
	The strategy implementation	Strategy implementation	Tseng & Goo (2005) Kamukama (2010) Shakina & Barajas (2012)	Company's website
		ERP, quality management systems implementation	Kamukama (2010) Murthy & Mouritsen (2011) Shakina & 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 & Wang (2008)	Company's Annual Report, section "Common information"
	Companies' financial policy	Financial leverage	Poletti Lau (2003) Riahi-Belkaoui (2003) Huang & 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 & Vargas (2003) Bruton et al (2010) Liang *et al.* (2011) Shakina & Barajas	Company's Annual Report*, sections "Shareholder name" and "Directors information"

			(2012)	
Relational Capital	Brand power	Well-known brand	Riahi-Belkaoui (2003) Hagg & Scheutz (2006) Murthy & Mouritsen, (2011) Shakina & Barajas (2012)	Search on company's name on the website: http://www.justmeans.com/top-global-1000-companies If it has a rank : 1 point, otherwise: 0 point.
	International penetration	Foreign capital employed	Shakina & 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 & 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 & 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 & Klock (2003) Huang & Wang (2008) Nogueira *et al.* (2010)	Company's Annual Report, section "Financial data" Estimation: Commercial expenses divided to Total costs
External factors of Intellectual Capital Transformation	Belonging to a particular industry	Industry	Huang & Liu (2005) Swartz & Firer (2005) Orens *et al.* (2009) Shakina & Barajas (2012)	Company's Annual Report, section "Common information", The main activity.
	Belonging to a particular country	Knowledge Economy Index	Shakina & Barajas (2012)	Search on company's

				location on the website: http://data.worldbank.org/data-catalog/KEI

- 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

Methodology

We investigate companies from European countries (Great Britain, Germany, Spain, Netherlands, Finland, Serbia, Portugal, Ukraine and Turkey). Countries were selected according to their position in the KEI-based ranking (Knowledge Economy Index 2009) designed by World Bank[2].

The datasets in this study were derived from a combination of several detailed longitudinal databases Bureau Van Dijk (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 emphasize the external factors of intellectual capital transformation, the database includes a number of indicators related to those factors.

The dataset 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. We have used the following criteria to decide if a particular company should be in the database:

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

Table 2 characterizes 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.

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

Variable	Year	Number of observations	Mean value	Standard Deviation	Min	Max
EVA©	2006	234	-19.74	169.46	-1,627.78	1,762.43
	2007	248	-36.13	192.17	-2,699.10	869.67
	2008	261	-66.00	313.55	-4,331.47	1,403.26
	2009	241	-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

[2] http://data.worldbank.org/data-catalog/KEI"http://data.worldbank.org/ data-catalog/KEI

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

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) = 2500***). The country factor is also significant (F= 2.6**; chi2(6) = 1800***). Nevertheless, these conclusions are drawn on the basis of rough estimations. 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.

To obtain an accurate picture of company 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.

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

Year	Creating Value		Destroying Value	
	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

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.

Our econometric specification is as follows:

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

Y – the dummy for value creation (explanatory variable)

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

Results

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

Table 4. Results of the regression estimation

Dependent Variable / Independent Variables	Panel 1 2006	Panel 2 2007	Panel 3 2008	Panel 4 2009
Employee expenses	-.0002 (.002)	.0002 (.002)	.00001 (.002)	.004 (.003)
Number of employees	.00001 (.00006)	-.00001 (.00006)	.00004 (.00008)	.00001 (.0002)
Board of directors qualification	.0247 (.454)	-.518 (.454)	-1.044* (.565)	1.677*** (.585)
R&D investments	.004 (.012)	-.0002 (.013)	-.021* (.011)	-.037*** (.013)
Patents, licenses, trademarks	.002 (.002)	.003 (.003)	.006*** (.002)	-.002 (.003)
Intangible assets	-.0002 (.0006)	.0004 (.0004)	-.0003 (.0005)	-.0003 (.0004)
Strategy implementation	-.239 (.452)	.406 (.454)	.375 (.524)	.298 (.868)
ERP, quality management systems implementation	-.545 (.436)	-.982** (.476)	.048 (.529)	-1.876 *** (.676)
Company's experience	-.0131** (.005)	-.0168*** (.006)	-.013* (.007)	-.008 (.008)
Financial leverage	.041 (.066)	-.013 (.117)	-.177 (.271)	-.342 (.272)
Owners/directors ratio	-.333 (.842)	.544 (.763)	1.214* (.745)	-.110 (1.035)
Well-known brand	1.567 (.735)	.852 (.717)	1.060* (.586)	1.888** (.764)
Foreign capital employed	-.074 (.522)	.202 (.526)	.310 (.647)	-.177 (.575)
Citations in search engines	-.085 (.117)	-.109 (.102)	.184 (.135)	-.456*** (.169)
Presence of subsidiaries	-.0003 (.002)	-.002 (.002)	-.00005 (.002)	-.028 ** (.0138)
Commercial expenses share	.204 (1.088)	.004 (.989)	.969 (.993)	1.903 (1.297)

Company is a manufacturer	.494 (.494)	.414 (.512)	.269 (.677)	-.886 (.852)
Company is in the oil industry	*dropped*	1.270 (.842)	*dropped*	-2.596** (1.173)
It is a trading company	.206 (.427)	-.010 (.452)	-.456 (.582)	-.967* (.599)
Knowledge Economy Index	.894*** (.265)	.446** (.228)	.183 (.235)	.593** (.311)
Intercept	-7.779 (1.950)	-4.203 (1.712)	-4.202 (1.891)	-4.641 (2.246)
Number of Observations (Groups)	212	224	224	213
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*****

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

The explanatory model powers (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 & Hsieh (2011). The amount of experience of an individual company seems to be important only under sustained economic growth. It is less important 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 & 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 & 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. Some previous research such as that by Huang & Hsueh (2007) and 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.

Discussion and conclusion

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

First, overall, 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 paper. 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 & Sidney (1998), Donaldson & 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 & Golovko (2003), Baxtera & 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.

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.

References

Aiginger K. (2010) Post Crisis Policy: Some Reflections of a Keynesian Economist. *WIFO Working Papers*, No. 371.

Baiburina E.R. and Golovko T.V. (2008) Empirical investigation of intellectual enterprise value and its factors for big Russian companies. *Corporate Finance*, 2 (6) pp.5-23

Baxtera R. and Matear S. (2004) Measuring intangible value in business-to-business buyer–seller relationships: An intellectual capital perspective. *Industrial Marketing Management*, 33, pp. 491– 500.

Beltratti A. and Stulz R. M. (2009) Why Did Some Banks Perform Better During the Credit Crisis? A Cross-Country Study of the Impact of Governance and Regulation. *NBER Working Paper No. 15180*

Bontis N. (2001) Assessing knowledge assets: a review of the models used to measure intellectual capital. *International Journal of Management Reviews*, 3(1): pp. 41-60

Bowman E.H. and Helfat C.E (2001) Does Corporate Strategy Matter? *Strategic Management Journal*. 22. pp.1–23 (WWW document) http://www.wiggo.com/mgmt8510/Readings/Readings4/Bowman2001smj.pdf

Bruton G.R., Filatotchev I., Chahine S., and Wrigh M. (2010) Governance, ownership structure, and performance of IPO firms: the impact of different types of private equity investors and institutional environments. *Strategic Management Journal*, 31 (5), pp. 491-509

Carmeli A. and Azeroual B. (2009) How relational capital and knowledge combination capability enhance the performance of work units in a high technology industry. *Strategic Entrepreneurship Journal*, 3(1), pp. 85–103. doi: 10.1002/sej.63

Carmeli A. and Tishler A. (2004) The relationships between intangible organizational elements and organizational performance. *Strategic Management Journal*, 25(13), pp. 1257–1278. doi: 10.1002/smj.428

Chang S.L. (2007) Valuing Intellectual Capital and Firms' Performance: Modifying Value Added Intellectual Coefficient (VAICTM) in Taiwan IT industry. *Unpublished doctoral dissertation*. Golden Gate University. San Francisco..

Chang W.S. and Hsieh J.J. (2011) Intellectual Capital and Value Creation-Is Innovation Capital a Missing Link?. *International Journal of Business and Management,* 6,(2), pp. 3-12.

Chen M.-C., Cheng S.-J., and Hwang Y (2005) An empirical investigation of the relationship between intellectual capital and firms' market value and financial performance. J*ournal of Intellectual Capital*, 6(2) pp.159-176

Choudhury J. (2010) Performance Impact of Intellectual Capital: A Study of Indian IT Sector. *International Journal of Business and Management*, 5(9) pp 72-80.

Delios A. and Beamish P.W. (2001) Survival and profitability: the roles of experience and intangible assets in foreign subsidiary performance. *Academy of Management Journal*, 44(5), pp. 1028-1038.

Diez J.M., Ochoa M.L., Prieto M.B. and Santidrian A. (2010) Intellectual capital and value creation in Spanish firm. *Journal of Intellectual Capital*, 11(3) pp. 348-367.

Donaldson T. and Preston L, (1995) The stakeholder theory of the modern corporation: Concepts, evidence and implications. *Academy of Management Review*, 20, pp. 65-91.

Durand R., and Vargas V. (2003) Ownership, organization, and private firms' efficient use of resources. *Strategic Management Journal*, 24 (7), pp. 667-675

Firer S. and Williams S. (2003) Intellectual capital and traditional measures of corporate performance. *Journal of Intellectual Capital*, 4(3) pp. 348-360.

Gleason K. I. and Klock M. (2003) Intangible capital in the pharmaceutical & chemical industry. *Department of Economics and Finance Working Papers*, [WWW document] http://scholarworks.uno.edu/econ_wp/10

Hagg C. and Scheutz C. (2006) Property brands, human capital and Tobin's q. *Journal of Human Resource Costing & Accounting* Vol. 10 (1), pp. 4-10

Himmelberg Ch.P., Hubbarda R.G., and Paliaa D. (1999) Understanding the determinants of managerial ownership and the link between ownership and performance. *Journal of Financial Economics,* 53 (3) pp 3533)mi.

Huang C. and Wang M. (2008) The Effects of Economic Value Added and Intellectual. Capital on the Market Value of Firms: An Empirical Study. *International Journal of Management* 25(4) pp. 722-731.

Huang C.F. and Hsueh S.L. (2007) A Study on the Relationship between Intellectual Capital and Business Performance in the Engineering Consulting Industry: A Path Analysis. *Journal of Civil Engineering and Management.*. XIII (4) pp. 265–271.

Huang C.J. and Liu C.J. (2005) Exploration for the relationship between innovation, IT and performance. *Journal of Intellectual Capital*, 6 (2) p. 237 – 252.

Huang S., Ou Ch., Chen Ch., and Lin B. (2006) An empirical study of relationship between IT investment and firm performance: A resource-based perspective. *European Journal of Operational Research*, 173(3), pp. 984-999.

Huang Y. and Wu Y. J. (2010) Intellectual capital and knowledge productivity: the Taiwan biotech industry. *Management Decision*, 48(4) pp. 580 - 599

Ittner Ch. D. (2008) Does measuring intangibles for management purposes improve performance? A review of the evidence. *Accounting and Business Research*, 38(3), pp. 261-272. doi: 10.1080/00014788.2008.9663338

Jayasingam S.H., Ansari M. A., Ramayah T. and Jantan M. (2012) Knowledge management practices and performance: are they truly linked? *Knowledge Management Research & Practice*, advance online publication, March 12, 2012; doi:10.1057/kmrp.2012.5

Jones G. H., Jones B. and Little P. (2000) Reputation as reservoir: The value of corporate goodwill as a buffer against loss in times of economic crisis. *Corporate Reputation Review*, 3, 21-29.

Kamukama A,.N. (2010) Intellectual capital and performance: testing interaction effects. *Journal of Intellectual Capital,* 11(4) pp. 554-574

Kaplan R. and Norton D. (1996) *The balanced scorecard*. Harvard Business Press.

Kaplan R. and Norton D. (2000) *The Strategy Focused Organization.* HBS Press, USA

Kristandl G.,and Bontis N. (2007) Constructing a definition for intangibles using resourced based view of the firm. *Management Decision*. 45 (9). pp. 1510-1524

Lee S.-H., Beamish P. W., Lee H.-Uk. and Park J.-H. (2009) Strategic choice during economic crisis: Domestic market position, organizational capabilities and export flexibility. *Journal of World Business.* 44(1), pp. 1–15

Liang C.J., Huang T.T. and Lin W.C. (2011) Does ownership structure affect firm value? Intellectual capital across industries perspective. *Journal of Intellectual Capital*. 12(4) pp. 552 – 570.

Maditinos D., Chatzoudes D., Tsairidis C. and Theriou G. (2011) The impact of intellectual capital on firms' market value and financial performance. *Journal of Intellectual Capital*. 12(1) pp. 132 – 151.

Majid M.A. and Lodhi S.A. (2009) Impact of Intellectual Capital on Shareholders Earning. *Australian Journal of Basic and Applied Sciences*, 3(4) pp. 3386-3398.

Meek G.K. and Sidney J.G. (1998) The Value added statement: An innovation for the U.S. companies. *Accounting Horizons*, pp. 73-81.

Murthy V. and Mouritsen J. (2011) The performance of intellectual capital: Mobilising relationships between intellectual and financial capital in a bank. *Accounting, Auditing & Accountability Journal,* Vol. 24(5) pp. 622 -– 646

Nieves J. and Osorio J. (2012) The role of social networks in knowledge creation. *Knowledge Management Research & Practice* advance online publication 20 August 2012; doi: 10.1057/kmrp.2012.28.

Nogueira C., Kimura H., Junior L.D.B. and Basso L.F.C. (2010) The Impact of Intellectual Capital on Value Added for Brazilian Companies Traded at the BMF-BOVESPA [WWW document]. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1571576

Nold III H. A. (2012) Linking knowledge processes with firm performance: organizational culture. *Journal of Intellectual Capital*, 13(1), pp.16 – 38.

Orens R., Aerts W. and Lybaert N. (2009) Intellectual capital disclosure, cost of finance and firm value. *Management Decision*. 47(10) pp. 1536-1554.

Ottoson E. and Weissenrieder F. (1996) *Cash Value Added - a new method for measuring financial performance.* New York,. : The Free Press, - 201 p.

Pal K., Soriys S. and Sura S.J. (2009) A Comparative Study of VAIC, EVA and MVA of Indian Banking Industry. *Pragyaan : Journal of Management*, 8(2), pp. 3-15

Palte R., Hertlein M., Smolnik S. and Riempp G. (2011) The Effects of a KM Strategy on KM Performance in Professional Services Firms*. International Journal of Knowledge Management* (IJKM), 7(1), 16-34. doi:10.4018/jkm.2011010102.

Poletti Lau J. (2003) Effects of Intangible Capital on Firm Performance. *VIIth Spring Meeting of Young Economists*. Leuven

Rappaport A. (1986) *Creating Shareholder Value - The New Standard for Business Performance*. New York, The Free Press.

Riahi-Belkaoui A. (2003) Intellectual capital and firm performance of US multinational firms. *Journal of Intellectual capital*. 4(2) pp. 215-26.

Sellers-Rubio R., Nicolau-Gonzálbez J.L. and Mas-Ruiz F. (2007) The economic value of patent protection and rivalry in the Spanish electrical sector. *European Journal of Innovation Management*, 10(4), pp.434 - 452

Shakina E. and Barajas A. (2012) The relationship between intellectual capital quality and corporate performance: an empirical study of Russian and European companies. *Economic annals*. LVII (192) pp. 79-98

Shrader R., and D.S. Siegel (2007) Assessing the Relationship between Human Capital and Firm Performance: Evidence from Technology-Based New Ventures. *Entrepreneurship Theory and Practice*, 31 (6), pp. 893-908.

Stern J. M. (2001) *The EVA Challenge: Implementing Value Added Change in an Organization*. Wiley.

Stewart, T. A. (2010) *Intellectual capital: the new wealth of organizations*. Crown Publishing Group.

Surroca J., Tribó J. A. and Waddock S. (2010) Corporate responsibility and financial performance: the role of intangible resources. *Strategic Management Journal*, 31(5): 463–490. doi: 10.1002/smj.820.

Sveiby K. E. (2005) The Intangible Assets Monitor. [WWW document]. http://www.sveiby.com/articles/companymonitor.html

Swartz N.P. and Firer S (2005) Board structure and intellectual capital performance in South Africa. *Meditari Accountancy Research*. 13 (2) pp. 145-166.

Tseng, C.-Y. and Goo Y.-J. J. (2005) Intellectual capital and corporate value in an emerging economy: empirical study of Taiwanese manufacturers. *R&D Management*, 35(2) pp. 187-201

Ugboro I.O., and Obeng K. (2000) Top management leadership, employee empowerment, job satisfaction, and customer satisfaction in TQM organizations: an empirical study, *Journal of Quality Management*, 5(2), pp. 247-272

Zaleha A.-S., Muhd-Kamil I., Jagjit K. and Hamezah M.-N. (2008) The Value Relevance of Intangibles Non-Current Assets in Different Economic Conditions. *International Review of Business Research Papers*, 4(2), pp.316-337.

Zaratiegui J.M. (2002) What does profit mean for Alfred Marshal? *International journal of Applied Economics and Econometrics*, 10(3) pp. 381-402

Zeghal D. and Maaloul A. (2010) Analyzing value added as an indicator of intellectual capital and its consequences on company performance. *Journal of Intellectual Capital*, 11(1) pp. 39-60.

Sabatini, F. (2008), Social Capital and the Quality of Economic Development. Kyklos, 61: 466–499.

Weede, E. and Kämpf, S. (2002), The Impact of Intelligence and Institutional Improvements on Economic Growth. Kyklos, 55: 361–380.

Kindleberger, C. P. (1988), The Financial Crises of the 1930s and the 1980s: Similarities and Differences. Kyklos, 41: 171–186