Company value creation: does the structure of intellectual capital matter?

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Abstract

Objectives

According to the framework of knowledge economy, production and management of knowledge are key aspects of firm's activity nowadays. Intellectual capital (IC) is the crucial factor for company survival in the market. Therefore it is vital to realize the way that this capital helps to create firm value. The purpose of this study is to test empirically one aspect of the relationship between intellectual capital components and business performance – the influence of intellectual capital structure on process of firm's value added creation.

Data

In order to analyze the process of intellectual capital transformation into the company value, the balanced panel data were collected. The sample consists of 64 British firms in 6 industries: retail and wholesale trade, machinery manufacture, chemicals manufacture, transport and telecommunications, oil extraction and producing. The panel includes five years: from 2005 to 2009. In order to obtain comprehensive data of chosen companies we used Amadeus Database (Bureau Van Dijk) as like as information from companies' websites.

Methods

As far as there is no singular method of measuring value added by intellectual capital, we used five the most common methods: EVA™, MVA™, FGV™, VAIC™, P/B ratio. We also used 14 variables as proxies for intellectual capital components.

The models are estimated with pooled cross-sectional OLS method.

Results

Most strongly influence of the intellectual assets structure is reflected in VAIC and FGV. At the same time, EVA and P/B ratio have weak or not significant relationship with the structure of the intellectual assets portfolio.

It should also be noted that models with human capital proxy in the denominator show a significant positive dependency between a ratio of the intellectual capital components and value added.

Moreover consideration of the industry factor changes the results only slightly.

Conclusions

The present study advances our understanding of how to manage knowledge-related resources and contributes to effective investment management. The results confirm that structure of intellectual assets has quite stable linear effect on the value added created by the company. The effect is observed both in the short and long term period. Consequently, management should consider not only an accumulated volume of intellectual capital, but also the ratio between these components in order to increase company value.

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Keywords: Intellectual capital, value creation, value added, asset structure, return on intellectual capital

Introduction

The term "knowledge economy" outlines the fact that nowadays knowledge has become an essential part of economy during the last decade. Thus it is important for companies to realize what kinds of knowledge are crucial for their activity and how to manage them. That is why knowledge-based assets are in the focus of empirical investigations.

Knowledge-based assets or another term "intellectual capital" or "IC" include valuable assets such as employees' knowledge, introduced information technologies, brand loyalty and established relationship with suppliers. In the academic environment the question of the ability of intellectual capital to create value added and company's performance indicators that can measure IC is going to be widespread (Pulic, 2000; Stewart, 2002; Riahi-Belcaoui, 2003; Youndt, 2004; Zeghal, Maaloul, 2010; Kimura at al, 2010). Despite this, research of process of converting intellectual capital and its components into financial performance of a company is still challenging area.

One of the issues in this field is the return on intangible assets that can be expressed, in particular, in value added or relative measure as the return on capital (Arthur, 1996; Bontis, 2000; Daum, 2001). As far as before the development of value-based management concept, costs such as R&D, marketing expenses and costs of training personnel were treated as firm's expenditures, not investments, then there was no need for measurement of their influence on firm value. In knowledge economy and in the circumstances of intensive usage of intellectual capital, companies should not only rationally invest in tangible assets, but also determine whether investments in intellectual capital of the company are effective. In this study we assume that priority direction of investments depends on what element of IC is in deficiency that is the current intellectual and tangible assets structure should be taken into consideration.

Hypothesis development

Authors of previous papers (Arthur, 1996; Bontis, 2000; Daum, 2001) argue that intellectual resources should be characterized by increasing returns on capital in contrast with tangible assets such as land, labor and capital. The main argument in favor of such assumption is that management of intellectual capital has the non-zero sum effect, when investments bring multiple pay off because of its immateriality. Daum

explains this by network effects and economies of scale due to the fact that initial investments in software or advertising begin to yield increasing returns after some point of inflection as company grows (Daum, 2001).

From another point of view, the reverse process can occur when an excessive investment in intellectual capital destroys value. This can be shown through the effectiveness analysis of investments in IC within the concept of economic value added. According to the methodology of calculating EVA, Stern and Stewart offer to capitalize R&D expenditures and costs on marketing, advertising and training personnel in order to reflect their long-term impact on the company's value (Stern, 2003). Thus, if we consider the capitalized costs as the value of created asset, the estimation of invested capital increases and therefore decreases its rate of return. In this case, excessive investment in intellectual assets, which does not result in a corresponding increase in operating profit, lowers the value of the company.

Empirical studies also have found no evidence of increasing returns on intellectual capital. Canibano analyzed previous research papers and found that marketing costs had not clear relations with company's value (Canibano, 2000). Huang and Wang (Huang, Wang, 2008) used regression analysis to examine the linear relationship of the equity market value and proxy indicators of intellectual capital and ascertained that these types of investments are not always positively correlated with company market capitalization. Moreover, traditional (industrial) companies' expenditures on accumulation of intellectual capital have positive or no correlation with equity capitalization, while marketing expenditures of high tech electronics companies have stable negative relationship with firm value. These findings may reflect the fact that in traditional industries companies generally invest in intangible intellectual assets moderately and do not reach the saturation point. Therefore in such industries intellectual capital does not create significant benefits, but also does not lead to company's value destruction. Probably, in contrast to traditional industries, in electronics where intellectual capital is used more intensively, investments in it may not meet optimal amount, and this situation will result in inefficiency and value destruction. A number of other studies (Shiu, 2006; Chen, Cheng, Hwang, 2005; Dıez et al, 2010, Garanina, 2009) dedicated to determination of intellectual capital's contribution to company value also show similar results. Their results indicate that some companies are characterized by negative returns on intellectual assets.

Perhaps this paradox can be explained by the fact that companies have not optimal combination of assets. The misbalance between the amount of material and intangible assets and / or misbalance between the components of intellectual capital is the main reason of negative impact of IC on equity value.

The theoretical papers devoted to the need to balance the assets or resources of the company have its origins in papers microeconomists talking about the balance between labor, capital and other resources to maximize the volume of output at least cost. Further the research topics on interaction of structure, interaction and balance of assets with the strategic effectiveness of the company had been in the shadows for a long time. They were considered in the concept of Enterprise asset management (Hampapur et al, 2011). This concept of managing non-current assets associated with the optimal scheme of maintaining investments in fixed assets (Sharma, Yadava, Deshmukh, 2011) and minimizing the amount of funds tied up in current assets (Filbeck, Krueger, 2005). However, development of resource-based view (RBV) changed the

situation. Analysis of the company's asset management in terms of strategic management has been actively used as part of the RBV, one of the founders of which is considered to be J. Barney. According to the resource-based view of the theory of the firm, its resources include "all assets, capabilities, organizational processes, firm attributes, information, knowledge, etc. controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness" (Barney, 1991). Barney analyzed the reason for the existence of successful companies - sustainable competitive advantage, that are advantages which do not have any competitor and which cannot be copied in order to receive benefits. Barney brings four requirements to be satisfied by a resource to have a potential as a source of competitive advantage (Barney, 1991): it must be valuable, rare, and imperfectly imitable and it shouldn't have strategically equivalent substitutes. These requirements are hardly could be met by tangible assets, therefore company's intellectual capital become one of the core topics in this field.

If we consider intellectual capital as a part of company's assets portfolio, we can assume that an optimal asset allocation may exist, that is IC structure that allows company to create value in the most effective way. As suggested by some researchers, the value of intellectual capital is measured as a multiplication rule. In other words there is synergy between its components. Supposed some complementarity of intellectual assets, underinvestment in one of the components also results in significant loss of the potential of company's value growth. Conversely, a surplus of investment will lead to higher costs and simultaneous absence of increase in output. Thus the optimal structure of intellectual capital components possibly exists, the deviation from which leads to the destruction of value.

Huang and Liu (Huang, Liu, 2005) revealed that the relationship between innovation capital, in particular R&D intensity, and firm performance is non-linear and has presumably inverted U-shape form. If so, then intellectual capital, at least some of its components, follows the law of increasing returns to a point of inflection and then the law of diminishing returns. Therefore, it is possible that investments in intellectual assets give the negative feedback, become ineffective and do not lead to an increase in company value.

Thus, the review of existing research papers demonstrates that on the form of return on intellectual capital and the impact of assets' structure, including intangibles, remains controversial, because the theoretical assumptions are at variance with the results of empirical research.

Performance measuring

In papers dedicated to intellectual capital analysis, company performance is usually treated as increase in efficiency or contribution in value due to the usage of intellectual capital in company's activities. Therefore these performance indicators can also be viewed as value of IC or return on it. Over the past few decades there have been many theories and concepts designed to measure the value of intellectual capital and its components. They can be classified on four categories of measurement approaches (Sveiby, 2001):

- Direct Intellectual Capital methods (DIC) assume that elements of IC can be identified and directly evaluated individually or as an aggregated coefficient.

- Market Capitalization Methods (MCM) assume that the difference between a company's market capitalization and value of tangible and financial assets can be explained by the impact of intellectual capital on company's value.
- Return on Assets methods (ROA) are based on calculation of the spread between company's return on assets and normal return on tangible assets. The basic premise used for consideration of such indicators as proxies for intellectual capital is the assumption that the normal economic profit generated by physical and financial assets, while abnormal profit is earned due to employment of intangibles.
- Scorecard Methods (SC) use scorecards or graphs in order to identify, range and report intellectual capital components.

Two of these groups – DIC and SC – are concentrated on internal information about company, unavailable for external shareholders, and therefore are out of our interest. The most general market capitalization method is market-to-book (P/B) ratio or similar method – Tobin's Q (Tobin, 1969). We also use MVA™, calculated as the difference between company market capitalization and book value of assets, in order to consider not only relative, but also absolute measure. The group of ROA methods includes EVA™ (Stern, 2003) as a short-term absolute measure, VAIC™ (Pulic, 1997) as short-term relative indicator and FGV™ (Roos et al, 2010) as long-term characteristic of company's prospects. Thus we use the overall set of performance indicators that gives comprehensive look at company's activity results.

IC proxies' selection

There is no consensus on a common framework of intellectual capital in the scientific literature and its presence and quantity can be estimated only by means of approximating indicators. In this study three-component structure of intellectual capital used: structural, human and relational. Indicators selected on the basis of previous empirical research papers in the field of IC (Zickgraf, Mertonetal, 2007; Starowiz, Marretal, 2005; Mouritsen, Bukh, 2003):

Human capital: salaries and wages, number of employees, board of directors qualification, rate of owners in the board of directors.

Structural capital: intangible assets, R&D expenditures, number of patents, presence of ERP systems.

Relational capital: brand reputation, company's site importance, site quality, location in region center, location in the city with more than 1 million citizens.

Data and Methodology

The sample of companies for survey consists of British companies. This choice of country is stipulated by the level of economy and stock market's development. United Kingdom has high Knowledge index, which means that knowledge are generated, adopted and diffused effectively. The sample includes companies of non-financial industries: wholesale and retail trade, manufacturing of machinery and equipment, chemical and petrochemical, transport and communications. The sample is limited to companies with size between 500 and 20000 employees in order to make it more homogeneous through the excluding the smallest and the biggest companies. The research period is from 2005 to 2009. Also firms without information about intellectual capital proxies were eliminated. Data for the survey have been obtained from Amadeus database

(Bureau Van Dujk), where financial reports are presented in unified Global format. Thus research sample comprised of 64 companies.

Dependent variables were estimated by the following ways:

$P/B\ ratio_t = MctCap_t / BVE_t$

$MVA_t = MctCap_t - BVE_t$

$EVA_t = EBIT_t*(1\text{-}mtax\ rate_t) - WACC_t$

$VAIC_t$ = ($Sales_t$ – Cost of $goods_t$ + Salaries and $wages_t$) / Salaries and $wages_t$ + ($Sales_t$ - Cost of $goods_t$) / ($Sales_t$ – Cost of $goods_t$ + Salaries and $wages_t$) + ($Sales_t$ – Cost of $goods_t$ + Salaries and $wages_t$) / $InvCap_t$

$FGV_t = MctCap_t – EVA_t/WACC_t$

where, MCtCap – market value of shares; BVE – balance value of equity; EBIT – earnings before interest and taxes; mtax rate – marginal tax rate; WACC – weighted average cost of capital calculated on Damodaran's data on cost of equity and debt and balance-based weights, Sales – company's turnover for the period t; Cost of goods – cost of products sold or services provided; Salaries and wages – company's expenses on workforce; InvCap – invested capital.

The calculation of proxy indicators of intellectual capital is presented in Table 1.

Table 1

IC proxy indicators' description

IC Component	Indicator	Description
HC	Salaries and wages	Company's expenses on workforce for period t
	Number of employees	Number of company's employees at the end of period t
	Board of directors qualification	Qualification was estimated by categorical variable which possess the value from 0 to 2. The maximum value means that more than 2/3 of directors from the board have PhD and significant work experience.
	Rate of owners in the board of directors	Part of directors in the board that owns company's equity
SC	Intangible assets	Value of intangible assets from financial reports at the end of period t
	R&D expenditures	Company's R&D expenditures for year t
	Number of patents	Number of patents that company owns. Data obtained through QPAT database
	Presence of ERP systems	Binary variable that has value 1 when company employs IT systems for resource planning such as «ERP», «Oracle», «NAVISION», «NAV», «SQL», «SAP», etc.
RC	Brand reputation	Company's brand was considered as well-known if it is included in international rating Global 1000
	Company's site importance	Parameter is estimated by rating Google PageRank that shows relative importance of company's web-site page. This categorical variable possesses the value from 0 to 10.

	Site quality	It is estimation of comprehensiveness and user-friendliness of company's site. For criteria were used: presence of section for investors, availability of choice of site language, usage of animated images, number of site pages. Each criterion is evaluated as 1 if it is met and 0 otherwise. The final parameter is calculated as a sum of criteria values, therefore the maximum value of this parameter is 4.
	Location in region center	Binary variable that characterizes if company's office is located in region center (county) where a lot of current and potential partners are located.
	Location in the city with more than 1 million citizens	Binary variable that characterizes if company's office is located in the city with population more than one million.

Empirical results

According to descriptive stats the sample is relatively heterogeneous, which can be explained by inclusion of the set of different industries that can cause distinction in size of intellectual capital and efficiency of its usage.

It should be noticed that mean value of MVA is negative. In other words market value of companies was lower than their book value in the majority of observations. This situation is probably the result of crisis, started from 2008 year. Although companies that own intellectual capital are expected to be crisis-resistant, economic crisis has influenced on homogeneity of both results and amount of intellectual capital.

Table 2

Descriptive stats of performance results

	P/B ratio	MVA	EVA	FGV	VAIC
Mean	1,1	-77839,6	3913,8	732638,0	5,7
Median	0,9	-24510,3	4636,2	424426,2	5,1
Maximum	11,0	8156096,0	149691,9	13544045,0	34,2
Minimum	0,0	-3449627,0	-219991,4	-244899,1	1,8
Standard deviation	1,2	894159,8	47621,5	1173292,0	3,0
Coefficient of variation	1,1	11,5	12,2	1,6	0,5

Consideration of descriptive stats of intellectual capital shows that they are more homogeneous: coefficient of variation is over the range 0,9 to 2,8. The maximum is recorded for number of patents. This should be caused be different need of intellectual property protection in chosen industries.

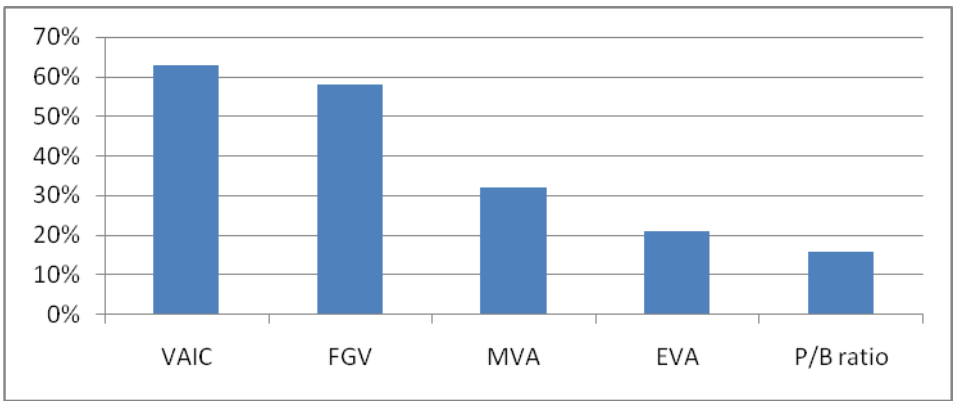
The model of dependence of performance results on assets structure that is empirically tested in this study is as follows:

$$Y = c_0 + c_1(x_i \div x_j) + \varepsilon, \quad i \neq j$$

where, Y – performance results indicator: P/B ratio, MVA, EVA, VAIC or FGV; x – proxy of intellectual capital.

This specification of model helps us to analyze the influence of proportion between intellectual capital components on the process of company's value added creation or destruction. However such model has essential disadvantage – it eliminates the possibility to use parameters that can be equal to zero as a denominator.

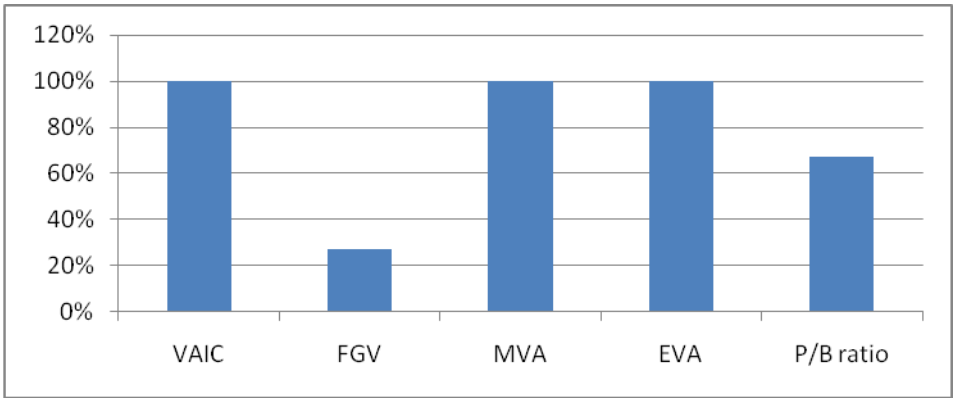
The graph 1 shows percentage of significant regression models for each performance indicator. The range of parameters that were used as a denominator in model was limited to number of employees, salaries and wages, intangible assets. Thus this study is concentrated on the balance between human capital and other kinds of intellectual capital.



Graph 1. Percentage of significant regression models

As can be seen from the graph 1, the most significant influence of the intellectual assets' structure is reflected by Value Added Intellectual Coefficient and Future Growth Value. At the same time, Economic Value Added, and P/B ratio have little or no stable connection with the structure of assets portfolio.

Also we want to emphasize on the sign of coefficient of regression models (c_1). As far as the majority of models have a proxy of human capital as the denominator, this sign can be treated in the context of level of employees' equipment. Moreover, in some studies human capital is considered as the main company's asset, which creates value added through the using of all other recourses, including intellectual capital (Wang, Chang, 2005). The graph 2 presents the character of influence of intellectual components' ratios on performance indicators. There is no consistency among the results. VAIC, MVA and EVA proves the statement that the more intellectual capital (per employee) company has the better its financial and strategic performance. But for all that FGV indicates that if company has high level of IC components then the prospects of performance improvement is less.



Graph 2. Percentage of models with positive relationship among significant regression models

Presumably, different industries should be characterized by various combinations of intellectual assets. Therefore the analysis of intellectual capital structure on the sample of several industries relations may be less stable. However, the introduction of dummy variables into the model in order to indicate industry's influence is only slightly changed the results.

To conclude the results confirm that the structure of intellectual assets has quite stable linear effect on the value added, created by the company. Moreover the impact is observed in both the short and long run periods. Consequently, company management should not focus only on accumulated volume of intellectual capital but should also consider the ratio of these components in order to increase company's value.

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