Intellectual Capital Assessment and Financial Indicators for Value-Based Management: the Joint Application

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Abstract. This paper develops an idea regarding value-based management model creation that conjoins financial and non-financial indicators of a company's performance, with an accent on intellectual capital elements assessment and their contribution to financial performance. A system of leverage-based indicators is proposed. The results of the regression analysis confirm that intellectual assets should be analysed separately in the context of their influence on financial performance. Based on the model, the consequence of managerial decisions is suggested.

Keywords: intellectual assets, financial performance, value management, leverages

1. Introduction

The analysis of the book and market value ratio of companies allows conclusions to be drawn about the serious contradictions existing between accounting and estimation models applied within the framework of accounting and financial management. According to leading experts (Strassmann, 1996; Sveiby, 1997; Edvinsson and Malone, 1997; Roos, Pike and Fernstrom, 2005 and others), "it appears from this that we deal not with a temporal aberration, but with a system-related defect of the applied methods of cost parameters determination" (Edvinsson and Malone, 1997). In practical terms, in the majority of companies there exists a discrepancy between the data in accounting reports and the real situation of an enterprise in market conditions. The cost of any enterprise has been identified with the price of its assets over a long period of global economic system development. In this context, assets have been traditionally understood as the entire company's property, which may be given a monetary value. In general terms, four types of assets are traditionally identified, three of which may be specified and measured, and the fourth becomes specific and may be measured only after its sale. The existing discrepancy has resulted in the absence of adequate perception of intangible assets value from the position of financial managers, who are guided by the criteria of new cost creation for a company when making financial and investment decisions.

The objective of our research is to establish compliance between the methods of intangible assets evaluation of a company forming its intellectual capital and the assessment methodology of the financial policy influence on the company's competitiveness based on the leverage concept. The hypothesis of our research lies in the fact that the use of a methodology that is clear to the company's financial managers will help in overcoming the resistance being observed at the promotion of projects in the sphere of the company's intellectual capital development.

2. Research methodology

Our research is based on the methods of observation, data collection, analysis and synthesis, mathematical modelling in economics and financial modelling. The applied methods of financial modelling are based on researches in the field of financial, technological and brand leverages, as well as an intellectual leverage, as instruments of impact on the company's competitiveness from the perspective of its assessment by the interested parties. In addition, polling methods (questioning) and personal interviews have been used in this research. The representatives of large, medium-sized and small innovation active companies in the north-western region of the Russian Federation who are responsible for making investment and financial decisions (top managers, chief financial officers etc.) have been selected to carry out the questionnaire surveys. The representatives of the same companies who are responsible for intellectual assets management have been selected for personal interviews. The sampling includes 81 companies in total; questionnaire surveys and interviews were conducted from October through to November 2015. On the basis of the data collected, regression analysis has been carried out to determine the dependence of the investments into intellectual assets made over the last three years on the level of financial stability of the companies under the conditions of financial crisis provoked by the low level of the world prices for hydrocarbons and the steep rise in the cost of loan fund capital in the Russian Federation.

3. Methodology of the intellectual assets assessment and the problem of their classification

There are many classifications regarding intangible assets and intellectual capital (knowledge-based capital) elements. From the perspective of our research, we can single out two groups of intangible assets.

The first group includes the intangible assets which, as a rule, are regularly evaluated, admitted and depreciated, such as acquired licences, patents, trademarks etc., the accounting of which is carried out on the basis of the acquisition cost.

The second group includes non-evaluated and non-admitted intangible assets. This is the category of assets in the modern economic paradigm, which provides for the increase in the company's market capitalization to the utmost. The intellectual capital as a set of intellectual assets represents something bigger than just a set of elements with a certain value. The functioning and interrelation of basic elements of the intellectual capital define the creation and growth of the company's value at present. In the same way as the company's capital assets need regular upgrading and renovation, the intellectual capital elements require investments for their continuous maintenance in an operational state. Thus, the value of intellectual assets consists not in their current market-value appraisal, but in the ability to provide an increase in business cost in the long term.

Three approaches – income, comparative (market) and cost approaches – may be applied for the assessment of intellectual property, as well as other objects that have actual or potential cost. In assessment-related literature (Smith and Parr, 2000; Glukhov, Korobko and Marinina, 2003), the following preference of application is recommended as regards approaches to IPI (intellectual property items) assessment (Table 1).

Table 1: The recommended preference of application as regards approaches to the assessment of intellectual property items

Intellectual property items	In the first place	In the second place	Hardly applicable
Patents and not patented technologies	Income	Market	Cost
Trademarks	Income	Market	Cost
Copyright items	Income	Market	Cost
Software products	Income	Market	Cost
Franchising rights	Income	Market	Cost
Qualified personnel	Cost	Income	Market
Distribution chains	Cost	Income	Market
Corporate practice and procedures	Cost	Income	Market
Management software	Cost	Market	Income

Thus, the existing assessment models are aimed at estimating the current parameters of intellectual assets value to an extent that it demands the application of traditional assessment approaches.

The key issue for finding the relationship between indicators based on financial reporting and intellectual capital-based indicators is the appropriate choice of indicators. They should match the following requirements: simplicity of calculations; the availability of empirical data to test them; the possibility of performing not only retrospective analysis, but also making forecasts based on them; their availability as tools for supporting managerial decisions.

There are several approaches used to measure intellectual capital on the basis of financial indicators. The mainstream one is the indication of intellectual capital impact on the company's value. Pulic (2005) introduced the Value Added Intellectual Coefficient (VAIC™), which later became very popular. It enables analysis of the contribution of intellectual capital components to the creation of value added:

$$\text{VAIC™} = \text{HCE} + \text{SCE} + \text{CEE,} \qquad (1)$$

where HCE = VA/HC (Human Capital Efficiency referring to per unit of value of human capital), SCE = SC/VA (Structural Capital Efficiency referring to per unit value of structural capital) and CEE = VA/CA (Capital Employed Efficiency referring to per unit value of physical and financial assets).

Pulic (2005) also proposed the Value Added Intellectual Potential coefficient (VAIP) for demonstrating how successfully intellectual potential creates value, and the Value Added Capital coefficient (VACA):

$$\text{VAIP} = \text{VA} / \text{IP}$$

$$\text{VACA} = \text{VA} / \text{CA,} \qquad (2)$$

where VA = value added, IP = intellectual potential and CA = physical capital.

Further research either developed this concept or tried to find an empirical approbation of the model. Thus, a second direction is represented in papers by Ozkan, Cakan and Kayacan (2016), Užienė and Stankutė (2015), Toorchi, Asiaei and Dehghan (2015), Örnek and Ayas (2015), Nuryaman (2015) etc.

Among Pulic's followers, the paper by Sumedrea (2013) is the most interesting. Relying on previous research (Pulic, 2000; Stahle, Stahle and Aho, 2011; Ordóñez de Pablos, 2004), it finalized the model development and proved the significance of the practical implication of VAIC™ for return on assets (ROA) factors analysis.

We believe that the only drawback of VAIC™ is its retrospective orientation. It helps in assessing the efficiency of actions that have already been performed, but it is impossible to base an estimation of the reasonability of new managerial decisions on it. So we tried to solve this problem in this paper.

We suggest using the leverage concept to enable understanding of the extent to which investments into this or that element of intellectual capital may contribute to the increase in cost as the main efficiency criterion of the enterprise's operation from the perspective of internal and external financial stakeholders (management and investors). In general terms, the leverage is determined by the change in the aggregate result due to the impact of the change in the investments into this or that resource. From the point of view of financial statements, leverage is interpreted as the change in profit under the influence of the change in this or that type of standing expenses. The analysis of these or those leverages of value creation (or profitability increase) allows targeted administrative impacts to be applied.

In relation to the objectives of our research, it is necessary to single out the types of leverages that can be used in analysing the intellectual capital and to make them compatible with traditionally used leverages, which have been singled out earlier, i.e. financial and operating leverages.

3.1. Technological leverage concept

A technological leverage concept has been worked out by a number of economists (Scholefield, 1994; Meyer and Zack, 1996; Platonov, 2000), as represented in Table 2.

Table 2: The elaboration of a technological leverage concept

Author	Concept description
Scholefield (1994)	Technological leverage is the degree to which a new technology may cause changes in a business environment and create competitive advantages for the enterprise implementing this technology.
Meyer and Zack (1996)	Technological leverage is the degree to which investments into basic products and platforms in ICT branches can form the basis for the development of final products intended for end-users.
V.V. Platonov (2000)	Technological leverage is a measure of an enterprise's ability to spread up-to-date knowledge and applied know-how received in the process of primary innovation into a variety of products for end-users.

In accordance with these researches, we can give the following formalized description of a technological leverage:

$$\text{TL} = \sum_{i=1}^{I} \frac{\text{AT}_i}{\text{AT}_1}, \tag{3}$$

where I means the number of new applications (*resulting production technologies, RPTs*) of *basic innovation technology, BIT*); AT_1 means the cost of tangible assets related to the development of BIT; AT_i means the cost of tangible assets related to the creation of the i-th RPT.

Even before the RPTs created with the use of basic innovation technology are implemented in the tangible assets of the enterprise, i.e. before the cost and the structure of the assets of an enterprise change, the technological leverage will influence them as intangible assets used during the development of the BIT and during the creation of the RPT are capable of increasing the market value of an enterprise. In this situation, the volume of investment into the RPT is reduced, as the enterprise uses the results of investment into the BIT at their creation. Therefore, the more actively an enterprise uses the BIT both during the RPT creation and within the technological transfer process, the stronger the influence of the technological leverage is.

The general influence (degree) of the technological leverage (ITL) is considered as the function of influence of the following three components:

Technological leverage (TL) as such, the value of which is equal to or more than 1, according to formula (3);

Price leverage (PL) originating due to the fact that a developer may establish higher prices for his production at the first stage and thereby receive higher marginal profit. The influence of the price leverage is not always positive; it appears to be such under favourable market conditions and effective cost management, i.e. in the case of a harmonious combination of price and operational leverages;

Development leverage (DL) originating due to the fact that knowledge and information that are received when developing basic innovation technology may be applied in the production of advanced or derivative resultant

products and technologies. The development leverage value is always positive, since a substantial saving on research and development costs may be possible in this case:

$$ITL = \alpha(DL; PL; TL) \tag{4}$$

$$\left. \begin{array}{l} TL \geq 1 \\ DL > 0 \end{array} \right\}$$

3.2. Elaboration of the technological leverage concept and its transformation into the intellectual leverage concept

The technologies and objects of intellectual property forming industrial property are far from being the only items in the entire list of intellectual assets of an enterprise. Structural capital and human capital can also be estimated within the leverage concept.

Human capital (*HC*) is one of the most important elements of intellectual capital. The main assessment models of HC have been developed for regional or national management levels. With regard to the corporate management level, the key directions are: health care, education and loyalty. These three directions are often considered by financial managers as operating expenses. It will be possible to understand the investment essence of these processes if managers see the signs of investment activity, the most important of which are the delayed result of today's decisions and the return on investment in the immediate future.

The leverage effect manifests itself in this case as the difference between the company's profitability, after carrying out the activities for human capital development, and the cost of the capital directed at the financing of development processes (leverage arm), which should be multiplied by the relation of the investment volume into the human capital to the total volume of the company's investments (leverage differential):

$$HRL = (R_t - CC_{IHR}) \times \frac{I_{HR}}{I_t}, \tag{5}$$

where R_t is the company's rate of return after carrying out the activities for HC development; CC_{IHR} = cost of capital directed at the financing of development processes; I_{HR} = volume of investment in HC; and I_t = total investment volume of a company.

As a whole, this model may be applied in order to estimate the expediency regarding the increase in the investments share into the creation of intellectual assets within the general structure of the company's investment programme.

3.3. Brand leverage and its contribution to the creation of the company's value

The efficiency of brand cost management depends on the brand potential, which is understood as a set of characteristics of a brand influencing the company's potential in general. The brand potential is an element of the enterprise's informational potential. The quantitative measurement of the brand potential is based on the brand cost estimate and on the market understanding of the brand essence (Raikin,2005). The brand potential is created by way of forming added economic value at the expense of brand market value increment and at the expense of sales volume increment ensured by the influence of brand strength on a consumer (the total effect of the impact of the market brand leverage and operating brand leverage). Therefore, the expenses related to the formation of the brand potential and its support should be taken into consideration. The effect of total brand leverage impact can be measured based on the assessment of the present value of cash flows generated by the impact of operating and market brand leverages:

$$NCF_{BLt} = \Delta V_t + \Delta NOI_t \tag{6}$$

where NCF_{BLt} is the net cash flow generated by the impact of operating and market brand leverages during the period t; ΔV = increment of the enterprise's value caused by the brand cost increment under the market brand leverage during the period t; and ΔNOI_t = increment of the enterprise's net operating income caused by the impact of the operating brand leverage during the period t.

We suggest calculating the operating brand leverage using the following formula:

$$BL_{op} = (RC_b - RP) \times dc_b \tag{7}$$

where BL_{op} is the operating brand leverage; RC_b = return on the costs for brand support and development; RP = return on production; and Dc_b = share of the costs for the development of brands in the enterprise's costs structure during the analysed period.

The return on the costs for the brand development (RC_b) will be calculated as the ratio of net operating income increment (NOI_b) caused by brand development to the costs associated with its development (C_b):

$$Rcb = \frac{\Delta NOI_b}{C_b} \tag{8}$$

The present value of cash flows being generated by brands will be calculated using the following formula:

$$PV_{BL} = \sum_{t=1}^{T} NCF_{BLt} \times PVF \tag{9}$$

where PV_{BL} is the present value of cash flows generated by brands; NCF_{BLt} = net cash flow generated by brands during the period t; and PVF = present value factor.

We recommend estimating the return on the investments into brand development and support based on investment profitability index PI:

$$PI_b = \frac{\sum_{t=1}^{T} NCF_{BL_t} \times PVF}{\sum_{t=1}^{T} I_t \times PVF} \tag{10}$$

where I_t are investments into brand development during the period t.

The company's value management has two main directions:

1. Management of economic value added creation, which is beyond the framework of this paper and has multiple descriptions in various academic papers and practical implications.

2. Intellectual assets management aimed at the maximization of their value. For the indicator reflecting the value growth, we may take the change in VIA (Value of Intellectual Assets) as follows:

$$\Delta VIA = VIA_1 - VIA_0, \tag{11}$$

where VIA_1 denotes the value of an intellectual asset at the end of the year, and VIA_0 at the beginning of the year.

The total value growth of a company, ΔV, is the sum of EVA и Δ VIA:

$$\Delta V = EVA + \Delta VIA \tag{12}$$

The process of value management is presented in detail in Figure 1. This process includes the traditional cost management created mainly at the expense of internal value factors, as well as the process of value management created at the expense of external value factors.

Stage 1	**Formation of the enterprise's value management objectives**

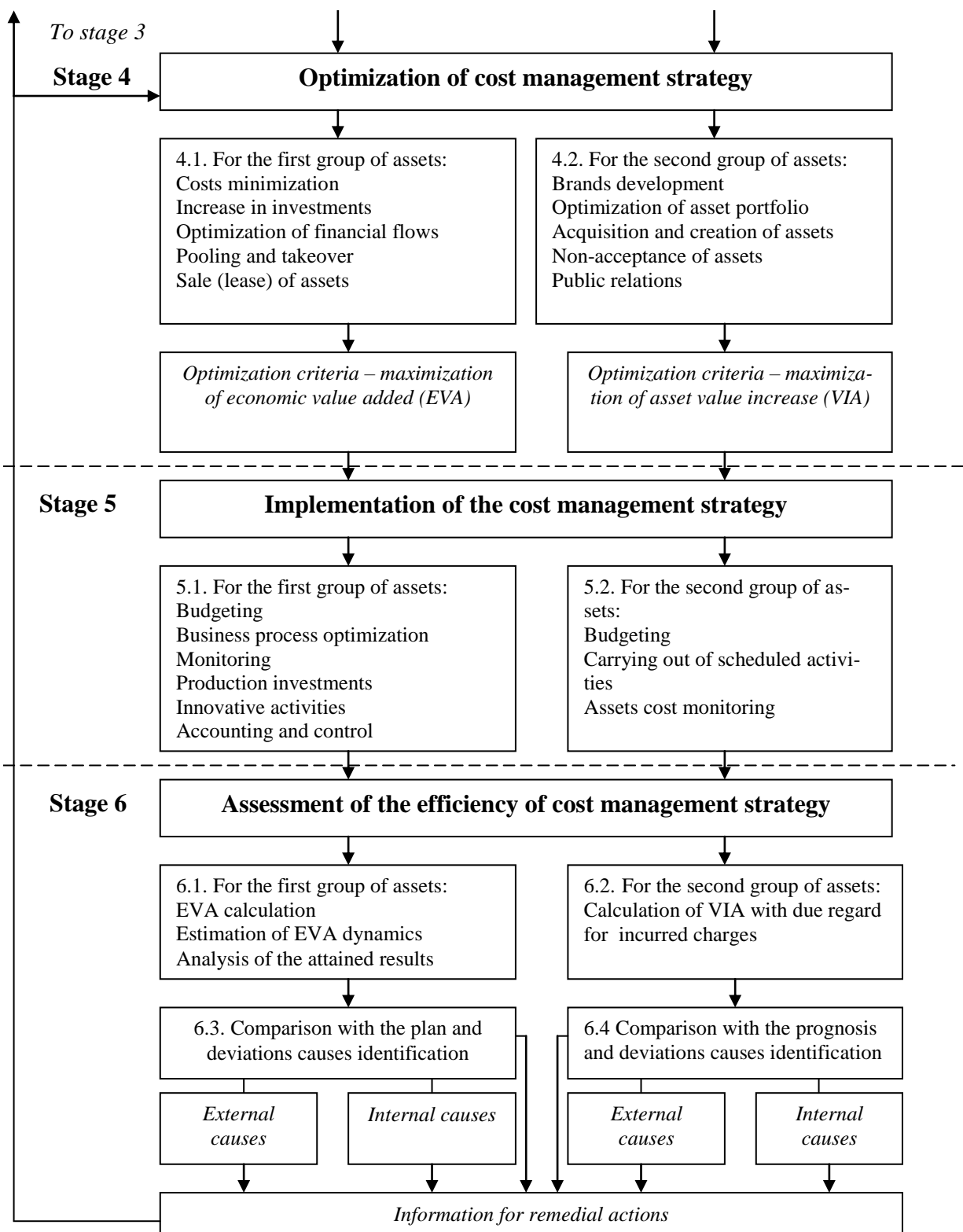| 1.1. Setting a strategic goal (maximization of the property status)	1.2. Current condition estimation and future condition forecast

Determination of real goal– required increase in value	*Calculation of the expected increase in value*

1.3. Setting the tasks of the enterprise's value management

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Stage 2   **Cost factors analysis**

2.1. Tangible assets

2.2. Intangible assets

Structural capital	Patents and licences	Informational potential	Human capital

The first group: assets evaluated and reflected in accounting documents	*The second group: assets not evaluated and not reflected in accounting documents*

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Stage 3   **Formation of alternatives**

Increase in profitability

Reduction in the cost of capital

From stage 6

3.1. For the first group of assets:
Property management
Increase in productivity
Industrial engineering improvement
Administrative and technical activities
Investments into development
Innovations
Sales promotion

3.2. For the second group of assets:
Evaluation
Assets management
Investments into development
Innovations
Analysis and control of cost factors

Increase in assets cost

To stage 4

Figure 1: The value management process.

4. Regression analysis

To reveal the relationship between intellectual capital investments and companies' financial performance, we carried out a survey of top managers of enterprises in St. Petersburg and Leningrad Region on May and October 2015. We selected sectors with high level of innovation activities because these are the sectors where enterprises generally invest in intangibles, including technologies, research and development, human capital, brands etc. Also we considered whether an intellectual capital management system or, at least, its elements exist within a company. The primary sample contained top managers of 210 companies

At the first stage it revealed that from 210 companies that formed the sample, only 81 approved their interest in IC management and answered negatively at the question on implication of intellectual capital management methods in their practice. We included them at the sample for the second stage of the study.

At the second stage we intended to reveal the relationship between the intellectual capital investments and the companies' financial performance. We gave our respondents the opportunity to make a qualitative assessment of the level of IC investments and financial performance dynamics because at the previous stage they have not provided the quantitative date eagerly.

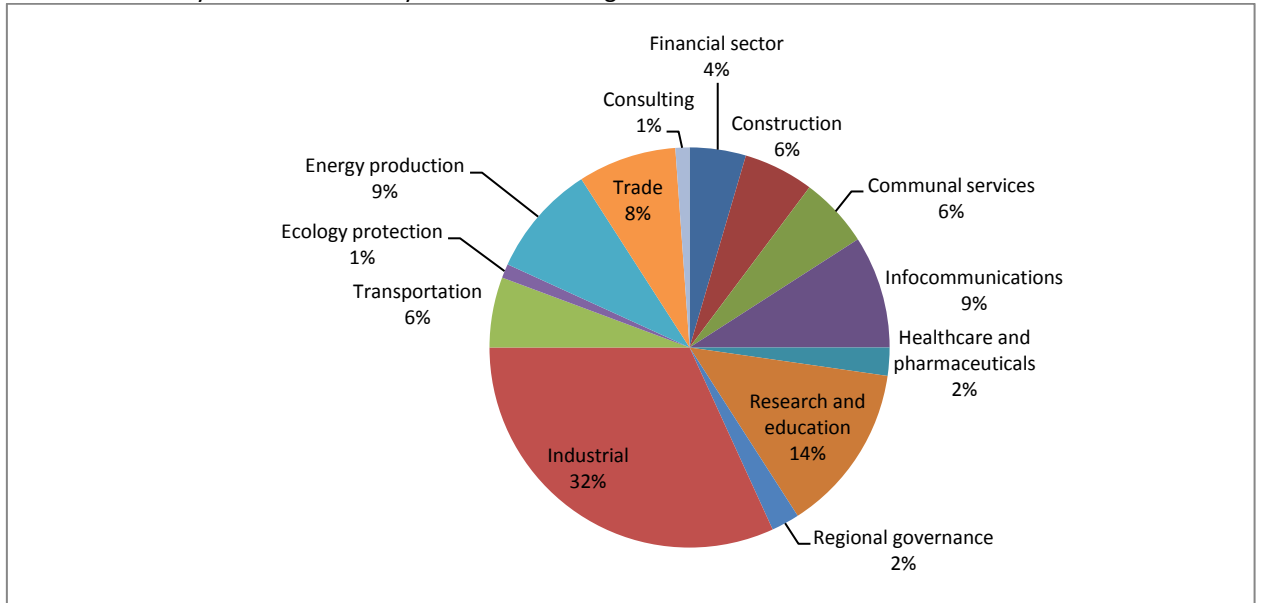The distribution by sector of economy is illustrated in Figure 2.

Figure 2: Enterprises distribution by sector of economy.

Respondents were asked to state how they would estimate the investments in the following items of intellectual capital for the previous three years:

1 – investments in technologies
2 – investments in human capital
3 – investments in brands.

The suggested answers were converted into points from 0 to 3, as illustrated in Table 3.

Table 3: Suggested answers converted into points

Question	No investments	Occasional investment	Several investments	Systematic investments according to the investment programme
1	0	1	2	3
2	0	1	2	3
3	0	1	2	3

To estimate financial performance, we asked respondents to express their opinion on the financial stability of their enterprises and proposed the following answers:

0 points – financial stability decreased
1 point – financial stability remained unchanged
2 points – financial stability increased. .

The regression analysis results are presented in Table 4.

Table 4: Regression analysis results

Regression statistics						
Multiple R	0.612704					
R-squared	0.375406					
Adjusted R-squared	0.351071					
Std. error	0.686494					

	Df	SS	MS	F		
Observations	81					
Regression	3	21.81062	7.270206	15.42669		
Residuals	77	36.28815	0.471275			
Total	80	58.09877				
	Coefficients	Standard error	t-statistics	P-Value	Lower 95.0%	Upper 95.0%
Y – intersection	0.360899	0.206342	1.749032	0.08427	-0.049980676	0.771779643
X 1 – technologies	0.062383	0.075464	0.826662	0.410983	-0.087884635	0.212650822
X 2 – human capital	0.100726	0.128874	0.781592	0.436851	-0.155893516	0.357346478
X 3 – brands	0.475586	0.117323	4.053648	0.00012	0.241966369	0.709206504

The model is statistically significant, but coefficients at X1 and X2 have a zero value in the confidence interval, so only investments in brand have a significant direct impact on financial stability: Y = 0.475586X3

5. Conclusion

In this paper a model of intellectual assets impact on a company's value is developed. We foresee this model as a development of the approach that adjusts financial indicators to the needs of intellectual capital elements assessment. The system of leverages also helps in understanding what factors are needed for improvement, i.e. what managerial decisions should be taken in order to increase the positive effect of intellectual capital elements on the company's value. The paper has a managerial implication because it could be used as a tool kit for creating a system of levering the effects of intellectual assets.

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