

UDC 65.011.4(497.5)

Review

Received: 18.03.2009

MEASUREMENT AND MANAGEMENT OF INTELLECTUAL CAPITAL *

Dragomir Sundac
Irena Fatur Krmpotic
University of Rijeka, Croatia¹

Abstract: Modern companies work in the conditions of so called New economy, where the knowledge becomes the basic economic resource. Traditional resources as land, capital and labour are determined by diminishing returns; knowledge instead is connected with increasing returns. Knowledge that can be used in the company for creating value represents the intellectual capital. By measuring intellectual capital, company can manage it. This paper shows concise overview of used methods for measuring intellectual capital. Authors measured intellectual capital in four companies in Croatia using Calculated Intangible Value (CIV) as a method. Results of measuring intellectual capital are complemented with traditional financial ratios. However, intellectual capital statement gives real outlook in competitive advantage of certain company. Every modern company should measure its intellectual capital value and report it as a supplement to traditional balance sheets.

Key words: intellectual capital, knowledge economy, measuring intellectual capital, Calculated Intangible Value.

INTRODUCTION

Huge transformations are taking place in the business environment of modern companies. These transformations are in progress in so called new, knowledge economy. New economy tries to explain business environment with constant changes, new laws of competitiveness, and new shapes of business organizations. New economy is based on two main trends – globalization and implementation of high technology in the business. Under such influence global tariffs are reducing, national markets opening and international trade increasing.

In the so called post-industrial society, traditional factors of production – land, labour and capital are replaced with factors of development – intellectual capital, machines, equipment, raw materials, social and natural environment. Now the knowledge becomes basic economic resource. Today company's value added is derived

* This article is the result of the scientific project *Human Resources and Economic Development of Croatia* (081-0811403-1409) financed by Croatian Ministry of Science, Education and Sports.

¹ **Dragomir Sundac**, PhD, Tenured Professor and Scientific Advisor, **Irena Fatur Krmpotic**, MSc, Research Assistant, University of Rijeka, Faculty of Economics in Rijeka, Croatia.

from knowledge, abilities and skills of employees or business partners and outer associates. Knowledge in the company can be used as input and output.

The aim of this paper is to stress the importance of knowing the concept of intellectual capital, identification and measuring its components for the purpose of managing this strategically asset of modern company. Value of intellectual capital can be easily measured and compared by competitors. Measuring and reporting intellectual capital should be a supplement to traditional balance sheet. Accounting is the record of past events, however estimating intellectual capital is the future prediction.

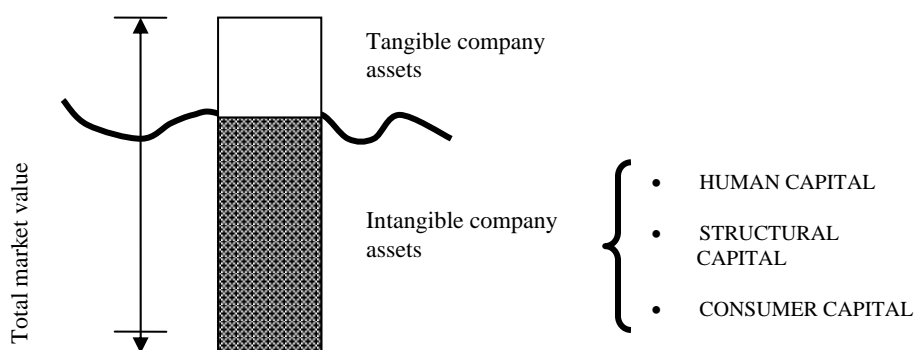
1. INTELLECTUAL CAPITAL – THE BASIC RESOURCE OF THE COMPANY

The concept of intellectual capital is a relatively new approach. In 1990s with the market liberalization start its more intense development. Managers realized that competitive advantage of the company could not longer be based on exclusive rights on natural resources, skilled workforce and economies of scale. In competitive environment such as today, by developing, managing and possessing intangible asset (intellectual capital) company can create wealth and survive on the market.

Intellectual capital represents the sum of everything that everybody within the company knows and that enables the company to create a competitive advantage in the market. That is the knowledge of employees; the knowledge of the research team of experts or the knowledge of manual workers who developed thousands of different ways to improve the efficiency of a company. Intellectual capital represents knowledge as a dynamic human process transformed into something valuable for the company (Stewart 1997, 9).

Following Figure displays the model of intellectual capital.

Figure 1: Model of intellectual capital



Source: Cf. Stewart, A.W. (2001) *The Wealth of Knowledge, Intellectual Capital and the Twenty-first-century Organizations*, Currency, Doubleday, New York, p. 13.

In the Figure above can be seen that the market value of the company is formed on the basis of tangible but also intangible company assets. The intangible company assets are far more important for the company itself because they make a far greater market value. The intangible company assets consist of the intellectual capital of the company.

Some theorists define intellectual capital as a common part of three essential components (Pulic and Sundac 1998, 56).

- Human capital – capability, knowledge, skills and experience of the company employees and managers plus the activity dynamics of an intelligent organization applied to a competitive environment.
- Structural capital – support to the infrastructure of the human capital which includes the system of information technology, corporation image, the owner’s data basis, organizational concepts, patent rights, licence rights and copyrights.
- Consumer (relational) capital – interaction between the company and its clients.

Human capital is certainly the most important component and the driving force of the intellectual capital. However, only the synergy of human, structural and consumer capital can result in strong intellectual capital that becomes the source of the company’s competitive advantage.

2. MEASURING INTELLECTUAL CAPITAL

Increased interests of measuring intangibles i.e. intellectual capital derive from increased value of the company that is not showed in its balance sheet. Hence, managers have incomplete information. Today companies have large gaps between the value of its tangible assets recorded on its balance sheet and its stock market-value. This ratio, known as the “market-to-book-ratio”, has grown especially large for service and high-technology companies. These companies invest huge amounts of money in intangible assets: R&D and brands.

Baruch Lev, from the Stern School of Business at New York University estimates that US industrial companies now invest as much in intangible assets such as R&D and training as they do in physical plant and equipment (Leadbeater and London 1999, 13).

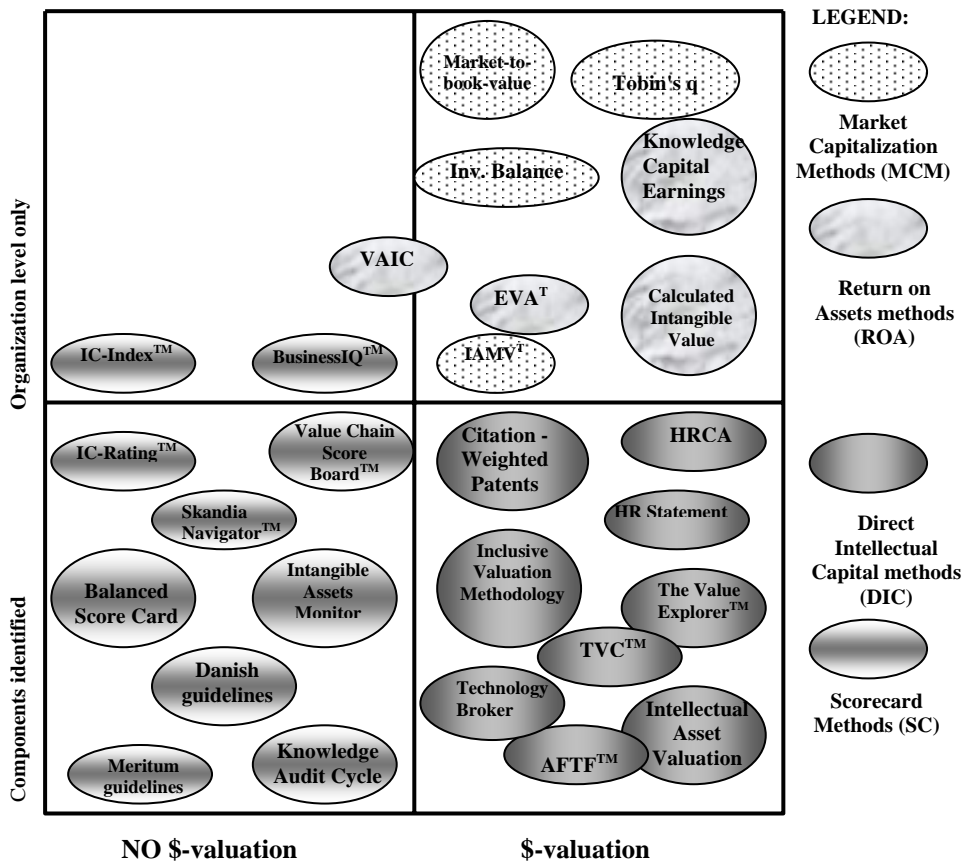
For these reasons experts work on development of new methods for measuring intellectual capital as a supplement to the traditional balance sheet. That would give more realistic overview on the firm’s value. There are certain numbers of methods for measuring intangibles that are already in use in companies worldwide, but none of them is yet universally accepted.

According to Karl-Erik Sveiby measuring approaches for intangibles fall into at least four categories of measurement approaches. The categories are an extension of the classifications suggested by Luthy and Williams (Sveiby 2004):

1. Direct Intellectual Capital methods (DIC) – where components are identified and valued,
2. Market Capitalization Methods (MCM) –where the difference between market capitalization and stockholders’ equity is calculated,
3. Return on Assets methods (ROA) – where tangible assets and the annual financial growth figures are compared to the industry average. Above average earnings are then utilized to estimate the value of intangible assets,
4. Scorecard Methods (SC) – where the various components of intellectual capital are indentified and reflected in terms of scorecards and graphs.

Following Figure displays all methods for measuring intellectual capital according to organizational level and financial perspective.

Figure 2: Intangible assets measuring methods



Source: Sveiby, K.E., Methods for Measuring Intangible Assets, <http://www.sveiby.com/Portals/0/articles/IntangibleMethods.htm> (12.03.2008)

Neither above mentioned method can fulfil all purposes for measuring intangibles i.e. intellectual capital. One must select method depending on purpose, situation and audience. However, the most important thing is to measure intellectual capital, so the managers would get insight on company's inner power for managing it.

3. MEASURING INTELLECTUAL CAPITAL OF COMPANIES IN CROATIA BY USING CALCULATED INTANGIBLE VALUE METHOD

Calculated intangible value (CIV) method is a part of Return on Assets methods (ROA). Developed by NCI Research managed by Thomas Stewart, calculated intangible value allows a company to place a monetary/dollar value on intangible assets. Calculated Intangible Value is approved «to determined the fair market value on the intangible assets of business» by the U.S. Internal Revenue Service in its Revenue Ruling 68-609. (Stewart 2001, 318) This method calculates the fair value of the intangible asset. CIV computes the value of intangible assets by comparing the firm's performance with an average competitor that has similar tangible assets. An advantage of the CIV approach is that it allows firm-to-firm comparisons using audited financial data and, as such, CIV can be used as a tool for benchmarking (Zambon 2002, 19). This method is very simple and applicable on the companies of different industries. Application of CIV method is inexpensive and available to all companies that would like to calculate its intangible assets i.e. intellectual capital. For this reasons CIV method is used in calculation of intangible assets of four companies in Croatia.

Determining CIV in seven steps:

1. Calculate average pre-tax profits (preferably all these steps should be done for a 3 year period so as to get a better result)
2. Get the average year-end tangible asset value
3. Divide earning by assets so as to get the return on assets (ROA)
4. Find out what the industry's average ROA is
5. Multiply the industry average ROA by the company's average tangible assets. This tells what the average company would have earned from that amount of tangible assets. Now subtract this result from the company's pre-tax profits obtained in step 1.
6. Calculate the average income tax rate over the time period and multiply this by the excess return. Subtract this number from the excess return to get the after-tax number (giving you the premium attributable to intangible assets)
7. Calculate the net present value of the after-tax figure by dividing the premium by an appropriate percentage (for e.g. the company's cost of capital). The result of CIV method is the *value of intangible asset of the company or intellectual capital*.

This final figure is not the amount left when one subtract the tangible assets from the market value. Rather, the amount reflects a measure of the company's ability to use its intangible assets to outperform other companies in its industry. A rising CIV indicates that a business is generating the capacity to produce future wealth – even if

the market hasn't recognized it yet. A weak or falling CIV may point to the fact that a company's investments in intangibles aren't paying off or that too much is still being spent on tangible fixed assets (Starovic 2008:17).

Large companies (with more than 250 employees) from different industries and with positive financial results (gain profit) are selected for calculation of intangible assets. These companies are differently knowledge- or capital-intensive.

Table 1: Croatian companies used in analysis

COMPANIES	Industry*
KONSTRUKTOR – INZENJERING d.d., Split	Construction industry
KONZUM d.d., Zagreb	Wholesale and retail trade
ERICSSON NIKOLA TESLA d.d., Zagreb	Part of manufacturing, electric and optical equipment
PLIVA d.d. Zagreb	Part of manufacturing, chemicals and man-made fibre

* According to National Classification of Economic Activities, Construction industry and Wholesale and retail trade are industries, but manufacturing is divided on 14 parts so Ericsson Nikola Tesla and Pliva are participants of different part of the same industry.

Source: FINA

CIV method is calculated through seven steps. Dividing average pre-tax profits by average year-end tangible asset value one can get return on assets (ROA) of the company. That is presented in the following table:

Table 2: Average return on asset of the sampled companies (2002-2004)

COMPANIES	ROA of the companies (average)
KONSTRUKTOR – INZENJERING d.d., Split	0,0901
KONZUM d.d., Zagreb	0,0279
ERICSSON NIKOLA TESLA d.d., Zagreb	1,4380
PLIVA d.d., Zagreb	1,7341

Source: Calculation based on data obtained from FINA

From the table above it can be seen that Konstruktor and Konzum have considerably smaller ROA in relation to the high technology companies such as Ericsson Nikola Tesla and Pliva. It means that by investing 1 Kuna in tangible asset, Konstruktor gain 0.09 Kuna pre-tax profits, Konzum 0.02 Kuna, Ericsson Nikola Tesla 1.43 Kuna, and Pliva 1.73 Kuna.

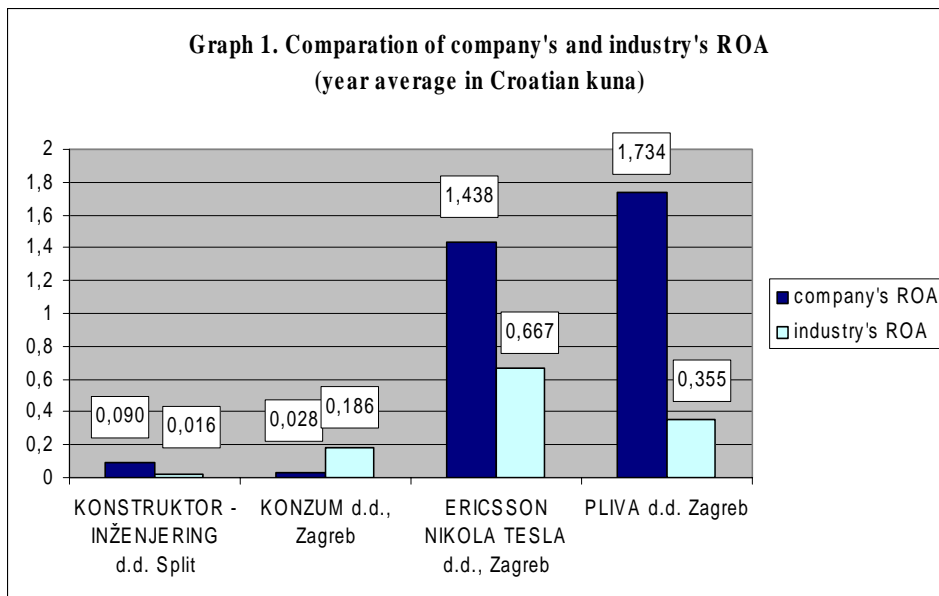
To get average industry return on assets, one has to divide average pre-tax profit by average industry tangible asset value. In the following table average ROA is presented:

Table 3: Average ROA for sampled industries in Croatia (2002-2004)

Industry	Average ROA
Construction industry	0,016
Wholesale and retail trade	0,186
Part of manufacturing, electric and optical equipment	0,667
Part of manufacturing, chemicals and man-made fibre	0,355

Source: Calculation based on data obtained from FINA

Table 3 shows that Construction industry on 1 Kuna invested in tangible asset gains in average 0.01 Kuna profit, Wholesale and retail trade 0.18 Kuna, companies in Manufacturing, electric and optical equipment 0.66 Kuna and companies in Manufacturing, chemicals and man-made fibre 0.35 Kuna. To stress the differences in average industry's and company's ROA following graph is presented.



Source: Data from Table 2. and 3.

All sampled companies, except Konzum, have bigger ROA in relation to average ROA of their industry. Konzum has significantly smaller ROA than wholesale and retail trade industry. That shortage probably exists because Konzum has huge tangible assets. Average opponent in the Wholesale and retail trade is more successful in using its tangible assets.

Industry's average ROA than multiplies by the company's average tangible assets. Result shows what the average company would have earned from that amount of tangible assets.

Table 4: Excess/shortage return for sampled companies with regard to Industry average ROA (in Kuna)

COMPANY	Industry average ROA x company's average tangible asset (1)	Excess/shortage return* (2)
KONSTRUKTOR – INZENJERING d.d., Split	2.467.584	11.848.064
KONZUM d.d., Zagreb	227.720.652	-193.546.646
ERICSSON NIKOLA TESLA d.d., Zagreb	96.139.485	111.016.377
PLIVA d.d., Zagreb	293.143.604	1.139.411.404

* This number is result of subtraction data from column (1) from the company's pre-tax profits. Result can be bigger or smaller than zero.

Source: calculation based on data obtained from FINA

Excess return shows the ability of sampled company to earn more from its tangible asset that outperform other companies in its industry. All sampled companies except Konzum, accomplished excess return in relation to its average opponent. Excess return indicates the revenue from intangible assets that can gain a value added to the company. Pliva and Ericsson Nikola Tesla generated huge revenue from intangible assets, Konstuktur somewhat smaller, while Konzum generated negative value. One could not claim that Konzum has no intangible assets or there is no revenue that can be gain from. That would be incorrect, because every company has intangible assets. Negative excess return or shortage for Konzum indicates that this company spends a lot on tangible fixed assets and neglects its intangible assets. Konzum works as a part of concern Agrokor, so it can be assumed that "the real value" of intellectual capital – "the brain" is situated on the higher level of this corporation. It is possible that the board of directors consciously governs Konzum's profit by strengthening other parts of this big Croatian concern. Probably, entire Concern uses Konzum as a "safe market" for distributing all their goods.

Table 5: Calculation of the premium attributable to intangible assets for sampled companies (in Kuna)

COMPANY	Excess/shortage return (1)	Profit tax (2)=(1)x0,2	Premium attributable to intangible assets (3)=(1)-(2)
KONSTRUKTOR – INZENJERING d.d., Split	11.848.064	2.369.613	9.478.451
KONZUM d.d., Zagreb	-193.546.646	0	-200.563.209
ERICSSON NIKOLA TESLA d.d., Zagreb	111.016.377	22.203.275	88.813.101
PLIVA d.d., Zagreb	1.139.411.404	227.882.281	911.529.123

Source: Calculation based on data from Table 5.

Hereafter, calculated average income tax rate (20%) over the time period is multiplied by the excess return. This result is subtracted from the excess return to get the after-tax number.

All sampled companies paid 20% profit tax on excess return. Konzum had shortage return so profit tax was not paid. After-tax number actually is the premium attributable to intangible assets of sampled companies. Premium attributable to intangible assets could not be calculated for Konzum, because of shortage return. CIV calculations for Konzum hereby finish. Other companies can precede the analysis by calculating the value of intangible assets.

To get net present value of the after-tax figure, premium has to be divided by the company's cost of capital (7% for sampled companies). Net present value actually is value of intangible asset i.e. intellectual capital.

Table 6: Net present value of the intangible asset's premium or value of intellectual capital of the sampled companies (in Kuna)

COMPANY	Value of intangible assets or Intellectual capital
KONSTRUKTOR – INZENJERING d.d., Split	135.406.447
KONZUM d.d., Zagreb	0*
ERICSSON NIKOLA TESLA d.d., Zagreb	1.268.758.592
PLIVA d.d., Zagreb	13.021.844.616

* Konzum gains financial loss.

Source: Calculation based on data from Table 5.




Table 6 values of intellectual capital for companies that generated positive intangible asset's premium. Above mentioned numbers represent the value of intangible assets that affect company's financial success, but are not completely recorded on balance sheets. High technology companies as Ericsson Nikola Tesla and Pliva gained very high values of their intangible assets, while labour-intensive constructive company as Konstruktor generated substantially lower value. However, calculated values of intellectual capital for sampled companies can not be compared to each other, because companies work in different industries which are differently capital-intensive or knowledge-intensive.

By using CIV method companies can identify fair market value of their intangible asset comparing it by average company in industry. This method tries to utilize from market operations in order to set a price and value of assets which are expected to contribute company's future benefits. CIV method provides the overview of future potential profits, as opposed to static balance sheets based on recording past events.

Intellectual capital value as a result of CIV method, companies use for determining their market position and their business potentials for future. After calculating value of intellectual capital companies should identify individual components of intangible assets or intellectual capital. In order to do that, companies can use Scorecard methods or Direct Intellectual Capital methods. It is important to stress that the company's aim is not to identify precise values of individual components of intellectual capital but just to note and map that intangible asset. Management of intellectual capital is based on its measurement, and vice versa.

In above calculation by using CIV method average values for three years were taken. But, value of intellectual capital can be measured annually, so its trend would be identified. Values of intellectual capital for sampled companies are presented in the following table.

Table 7: Annual value of intellectual capital for sampled companies (2002-2004)

Company	Value of intellectual capital			Trend
	2002	2003	2004	
KONSTRUKTOR d.d.	40.044.202	176.229.941	190.244.015	
KONZUM d.d.	Within sampled three years devaluation of intellectual capital is recorded!			
ERICSSON NIKOLA TESLA d.d.	734.114.061	1.331.734.423	1.749.421.203	
PLIVA d.d.	26.729.318.381	1.383.314.640	0*	

* In 2004. Pliva gain financial loss, therefore value of intellectual capital by CIV method can not be calculated.

Values of intellectual capital can be compared with traditional financial ratios of sampled companies, as can be seen in the following table.

From above table it can be seen that the more important financial ratios for long term business (financial stability ratio, economic ratio, and profitability ratio) affect directly on increasing of company's intellectual capital, and vice versa.

Companies familiar with importance of intangible asset i.e. intellectual capital for their long term growth and development should work on increasing above mentioned financial ratios. With business stability and constant progress company increases its intellectual capital.

Table 8: Comparison of financial ratios trends by values of intellectual capital for sampled companies (2002-2004)

Company Financial ratio	KONSTRUKTOR	KONZUM	ERICSSON NIKOLA TESLA	PLIVA
Liquidity ratio	↘	↘	↗	↘
Financial stability ratio	↗	↗	↗	↘
Debt ratio	High- increasing	High- increasing	Low- increasing	Low - stagnating
Activity ratio	↗	↗	↘	↘
Economic ratio	↗	→	↗	↘
Profitability ratio	↗	→	↗	↘
Intellectual capital	↗	↘	↗	↘

Source: Calculation based on data obtained from FINA and Table 7.

CONCLUSION

Fast growth of science and technology bring the mankind on the “door-step” of fourth science-technological revolution. Hereby, business is more and more based on micro technology that completely changes company’s business environment. That environment becomes more globalize and based on informatics. Because of that, companies are faced with new roles of doing business – roles of so called new economy. New economy promotes new products, services and market that are based on computers, mobile communication and Internet.

In the post-industrial society tangible factors of production (labour, land and capital) are replaced with intangible factors of development. In order to create competitive advantage company uses its intangible components known as intellectual capital. Intellectual capital as a complex economic category consists of three components: human capital, structural capital and customer or relational capital. Only the synergy of human, structural and consumer capital can result in strong intellectual capital that becomes the source of the company’s competitive advantage and value added.

Every company has intellectual capital and all its components. Very often, companies are not aware of its value. Measurement and management of intellectual capital with assistance of ordinary accounting or managing procedures can not give correct information. Accounting is developed for manufacturing companies and

measure finance and tangible asset's value. In the knowledge society, value of the company and its products and services is based on knowledge and intellectual capital. Because of that new methods for measuring intellectual capital have to be implemented in the companies.

About thirty methods for measuring intellectual capital are in use in companies around the globe. In this paper Calculated Intangible Value method is used on four big and profitable companies from different industries in Croatia. Results of CIV method show that three of four sampled companies are more successful than their average opponent. These three companies gain bigger return on tangible assets (ROA) than their average competitors. This excess returns result from more successful tangible asset's management. Excess return in relation to average return on tangible assets represents the premium of intangible assets. After paying taxes and calculating net present value, one can get value of intellectual capital.

Comparing results of calculation financial ratios by those of CIV method can be concluded that these two methods are complements. In fact, long term oriented financial ratios (financial stability ratio, economic ratio and profitability ratio) affect directly on value of intellectual capital. Increase of before mentioned financial ratios are attended by increase of intellectual capital's value. In order to identify and value individual components of intellectual capital, it is recommended to use CIV method in combination with Scorecard methods or Direct intellectual capital methods. Therewith, companies would get more reliable information about values of individual components of intellectual capital.

In measuring intellectual capital, companies should not tend to calculate exact values, but to identify trends. Hereby, continual measurement of intellectual capital forms the basis for its management and reinforcement of company's competitive advantage.

REFERENCES

- ***, Calculated Intangible Value method <http://www.brint.com/wwwboard/messages/352.html> (14.03.2008)
- Leadbeater, C., & London, D. (1999). *New Measures for the New Economy*, International Symposium: Measuring and Reporting Intellectual Capital: Experience, Issues, and Prospects, Technical Meeting, Amsterdam, www.oecd.org/dataoecd/16/24/1947910.pdf (10.03.2008)
- Pulic, A., & Sundac, D. (1998). *Intelektualni kapital*, I.B.C.C., Rijeka.
- Starovic, D. & Marr, B. (2002). *Understanding corporate value: managing and reporting intellectual capital*, CIMA, str. 17, http://valuebasedmanagement.net/articles_cima_understanding.pdf (19.01.2008)
- Stewart, T.A. (1997). *Intellectual Capital: The New Wealth of Organizations*, Doubleday/Currency, New York.
- Stewart, T.A. (2001). *The Wealth of Knowledge, Intellectual Capital and the Twenty-first-century Organization*, Doubleday/Currency, New York.
- Sveiby, K.E. (2004). *Methods for Measuring Intangible Assets*, <http://www.sveiby.com/Portals/0/articles/IntangibleMethods.htm> (12.03.2008)
- Zambon, S. (2002). *Accounting, Intangibles and Intellectual Capital: an overview of the issues and some considerations*, University of Ferrara, First Report, http://www.euintangibles.net/library/localfiles/WP4/4.14_Zambon_2002a.pdf (14.03.2008)