Intellectual capital in function of increasing efficiency of business in organization

Veljko Dmitrović
Faculty of Organizational Scineces
University of Belgrade (Serbia)
Email: dmitrovicv@fon.bg.ac.rs
Corresponding Author

Nikola Radovanović
Intellectual Propery Office (Serbia)
Email: nikola.radovanovic.ip@gmail.com

Nevenka Žarkić-Joksimović
Faculty of Organizational Scineces
University of Belgrade (Serbia)
Email: nevenka@fon.bg.ac.rs

Abstract

In the twenty-first century, the intellectual capital is the main driver of creating added value in organizations, and in scientific circles there is a growing awareness that skilled employees contribute to positive change, innovation, development and achieving and maintaining competitiveness in a truculent market conditions. Having in mind that the organizational capability to innovate is seen as a key factor of intellectual capital, it is generally considered that organizational innovativeness capacity is based on its skilled and educated workforce. We have tested this findings by analyzing the effect of the organizational human capital on the innovation capability in technology and knowledge intensive industries in Serbia, based on the descriptive statistics methodology. Our results suggest that the human capital indicators used in this study do not significantly influence innovativeness of organizations from selected industries.

Keywords

intellectual capital; innovation; competitiveness; adequate financial reporting; intangible assets, human capital

1. Introduction

Adequate financial reporting requires incorporated information concerning the intellectual capital of the organization. Considering the adopted set of financial statements does not include information of this type, it is necessary to adhere prescribing creating additional report on intellectual capital. In the focus of the contemporary world tendencies is question of investors – which elements are incorporated in intangible assets, as per studies it has significant value precedence over the material

This paper discusses the importance of intellectual capital in organizations, and the necessity of its measurement and presentation of the supplementary financial statements. The aim is to conduct research in order to prove the link between education as a part of human capital and innovations which are implemented in organizations. Knowledge of employees can be formal and informal, and the ultimate effect of the added value in organizations should be reflected in the synergy of knowledge. In some organizations, highly trained staff with specializations represent a prime mover in the process of value creation, while in some other business process experience, resourcefulness and shrewdness stand out as primary factors. Therefore, the factors of formal and informal education and developed skills affect the efficiency of the business organization.

2. Acquisition of knowledge

Intellectual capital is the most important capital of individuals, companies and state. It focuses on the individual who, from the beginning of his life, learn, acquire knowledge, and gradually generates value. Knowledge is acquired through formal and informal way, with an investment of family, environment, and using hierarchical structured educational institutions from nursery to post-doctoral studies. The interaction of individuals, ie. grouping, create added value, as regards form social capital.

The process of acquiring knowledge is not formally structured, as the formal and informal acquisition of knowledge is intertwined. In some individuals, the acquisition of experiential knowledge is followed by the formal education. In any event, in order to sustain and improve better positioning, continuing education through the acquisition of new experiences and formal ways of acquiring knowledge is inevitable. Theory and practice in their combination create added value. Monitoring of the current development of the company requires the observation of the process of development of knowledge in order to generate value. *Effective IC management in knowledge enterprises requires permanent monitoring of efficiency in the use of multivarious intellectual resources* (Krstić and Bonić, 2016). Benchmarking could be very useful process because of the complexity of measuring intangible assets.

3. Intellectual capital in the organization

In the knowledge era, intellectual capital represents the main driver of survival and development of enterprises (Stewart, 1997) Intellectual capital is declared as a leading performance, and is a crucial process based on its management. Intellectual capital, as part of intangible assets, the value of which has seen rapid growth in relation to tangible assets in the last four decades, requires adequate methods of measurement, and then the proper communication about it. Since the information of this type does not appear in the traditional set of financial statements, adequate reporting on company business situation requires the creation of additional reports. Fijalkowska and Jaruga-Baranowska (2008) conclude that the

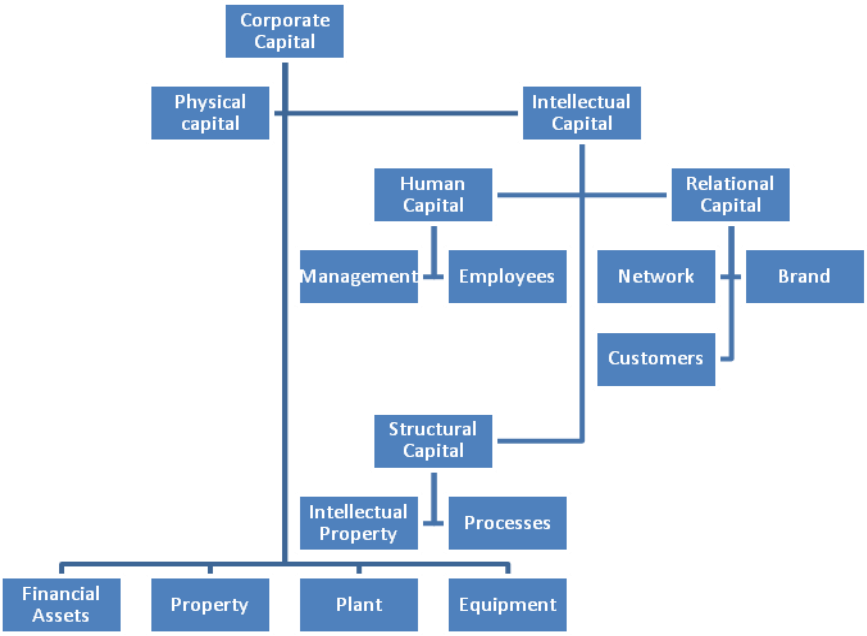
indicators which are used for creating Intellectual Capital Statement have to visualise intellectual capital beside the measuring and evaluating.

One way to grasp the significant share of an intangible asset that is not under the umbrella of the information set of financial statements is the difference between the book and market value ot the organization. This difference is often the starting point in the study, and therefore clearly gives the quantitative importance of untold intangible assets.

Intellectual capital is defined as a set of information, skills, knowledge and intellectual property. Generally accepted division of intellectual capital is into three parts: the human, organizational (structural) and relational (client) capital, based on a model created by Stewart (1997). Human capital is linked to the employees, their education, skills, and talents. Under the structural capital means the intellectual property, business structure and business methodology prescribed documentation, programs, procedures etc. Client capital includes all connections which the company has with external factors, ie. their clients. General performance of the company is reflected in the synergy of these three basic elements, since they create value by interaction.

Norton and Kaplan opened a new chapter with the publication *Balanced Scorecard* in 1992 where the value of the company is presented through four perspectives (financial perspective, customer perspective, internal process perspective and learning and growth perspective) and thus combine financial and non-financial capital.

Figure 1. Classification of Intellectual Capital's elements



Source: Intellectual Capital Defined, IC Knowledge Center, 2008

The above picture shows the organization's capital, which consists of two basic parts. *Physical capital* is fully shown in the balance sheet, while from another part - *intellectual capital* (or more broadly intangible assets), balance sheet shows only the information on intellectual property, which incorporates brands, and even does not display brand value properly. This picture shows basic elements of organization's value. Physical assets are easy to measure, and extremely precise quantified and absolutely visible in the balance sheet.

Explanation of intangible assets is strictly defined in accounting theory, which is represented in International Accounting Standards, *IAS 38 – Intangible Assets*, and does not

include immaterial intangible assets that are unequivocally involved in the process of value creation: the knowledge and skills of employees, procedures and processes of the company, reputation and image of the company. *The value of intellectual capital is very subjective and contrary to physical assets it may disappear within a short period of time* (Lev, 2001). Since the method of measurement and evaluation of a large part of intangible assets is not strictly regulated, suspiciousness valuation can be reflected in coincidence and randomness.

4. Innovation capabilities and intellectual capital

One of the main drivers of intellectual capital of the organization is the ability to innovate (Edvinsson and Malone, 1997). Innovations represent one of key sources of companies' wealth and, as such, they are crucial factor of intellectual capital. They can include not only outputs of in-house research and development efforts, but also product or service adjustments, new process, commercialization of new technology, or even new sales or marketing techniques. Even though patent applications are one the most consistently used indicators of innovativeness of organizations, innovation capacity is also influenced by non-patentable innovations and organizational potential to successfully complete research and development projects, whether alone or in partnership with other organizations. In their model for determining competitiveness in high-tech industries, Yanrong, Yu and Kang (2011) suggest that research and development capabilities stand as one of the main competitiveness factors. According to their model, research and development efforts include number of patents, success rate of new product development, share of researchers and scientists (as well as the share of educated workforce) in the total number of employees, and other. Positive link between the share of researchers and scientists in the total number of employees and the capabilities to undertake research and development projects has been highlighted by Mowery and Oxley (1995) and Escribano et al. (2006).

Innovativeness heavily relies on the organizational human capital (Herrera et al, 2010). Nowadays, desired employees are the ones who can quickly learn and adapt, who can utilize abundance of knowledge and transform knowledge into innovations, hence, who can innovate (Armstrong, 2001). Armstrong (2001) goes on to define characteristics of an ideal employee, which according to him are: creativity, innovativeness, capabilities to develop own ideas, desire to share knowledge with others, orientation towards experimenting and constant thinking. Employees should be able to create, apply, transfer and commercialize knowledge. There are various definitions of human capital. Stockley[1] defines it as an acknowledgment that people in organizations represent important, if not crucial, asset for contributing to organizational development in a similar way to physical assets, such as machines or money. On the other hand, Bontis stated that human capital represents combination of intelligence, abilities and expertise, which gives distinctive character to an organization. Davenport (1999) emphasized that human capital consists of nonmaterial resources, which employees give to their employers. Human capital is perceived as the most „active" form of intellectual capital, which can be managed and whose contribution to the value of intellectual capital of organizations can be maximized (Armstrong, 2001).

Human capital, or in a greater picture – intellectual capital, is significantly dependent of skilled workforce, which is mostly measured by the number of graduate-level workers and the number of researchers and scientists in an organization. In their study, Todo et al. (2009) state that graduate-level educated workers positively affect productivity in multinational companies, which is based on the evidence from spillovers from multinational companies into domestic firms in China. Increased amount of spillovers does not take place unless

[1] Available at: *derekstockley.com.au/newsletters-05/018-human-capital.html.*

multinational companies employ highly educated workers. The importance of researchers and scientists for innovation is highlighted by Herrera et al. (2010), whose findings confirm that scientific knowledge from this group of employees positively affect both inputs and outputs of the organizations' innovation process. In supporting this view, there are other findings which emphasize that the knowledge that researchers produce has a greater likelihood of leading to radical innovations (Czarnitzki et al., 2008; Zucker et al., 1998; Adams, 1990). Skilled workforce in an organization tends to merge into *community of practice*, on an informal basis. They cooperate within such community in order to use their ability to solve particular problems and share knowledge for that purpose (Quintas and Ray, 2002). Important knowledge often lies in *old professionals* (also called *gray hairs*), i.e. experienced employees who spent long periods gaining experience in certain activities (Wellman, 2007). Their eventual departure from organizations normally leads to the knowledge base erosion, which is why organizations should tend to carry out internal training programs in order to transform such, often tacit, knowledge.

Having in mind the abovementioned, we have carried out the analysis of the relationship between the ratio of graduated employees, scientists and researchers to the total number of employees, represented here as the human capital indicators, and the initiated research and development projects, new products and services launched and patent applications filed, represented here as the innovation capabilities indicators.

5. Research methodology

For the purpose of the research, a survey has been carried out among 53 organizations in Serbia. All respondents came from technology and knowledge intensive industries, as per NACE rev. 2 classification. Interviewed organizations needed to provide the number of employees with high education, as well as the number of scientists and researchers, and the total number of employees. Regarding the innovation capabilities, interviewed organizations were asked to provide information on the research and development projects undertaken, on the number of new products and services, and on the number of patent applications filed. These innovation capabilities indicators were provided for the years of 2011 and 2012, in order to get normalized and average data on each indicator.

In order to analyze the relationship between human capital variables and innovation capability, we decided to use the three-level grouping of organizations per innovation capability level. Therefore, organizations were put into groups with low, medium and high innovation capability, based on their provided data on innovation capability indicators. Following the grouping of organizations, we then analyzed the relationship with descriptive statistics, by using crosstabulation and one-way ANOVA test.

6. Research results

The analysis of the provided data on innovation capability indicators of respondents has revealed that most of interviewed organizations have high innovation capability. In total, 30 respondents fall into category with high innovation capability, which is 57% of all organizations in the analysis. Group with medium innovation capability includes 9 organizations, or 17%, while 14 respondents, or 26%, belong to the group with low innovation capability. The average total share of employees with at least graduation degree was 43,25%, while the share of scientists and researchers amounted to 11,56% of total

employees, which was somewhat below expected numbers, having in mind that the respondents came from technology and knowledge intensive industries.

Regarding descriptive statistics which followed, with the high value of asymptotic significance for both human capital variables and their relationship with innovation capability, the crosstabulation results have shown that there is no statistically significant difference between groups.

Table 1. Chi-Square Tests – Graduate employees / Innovation capability

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	89,217[a]	90	,504
Likelihood Ratio	87,380	90	,559
Linear-by-Linear Association	,000	1	,999
N of Valid Cases	53		

a. 138 cells (100,0%) have expected count less than 5. The minimum expected count is ,17.

Table 2. Chi-Square Tests – Researchers and scientists / Innovation capability

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	42,563[a]	48	,694
Likelihood Ratio	43,970	48	,639
Linear-by-Linear Association	3,418	1	,064
N of Valid Cases	53		

a. 73 cells (97,3%) have expected count less than 5. The minimum expected count is ,17.

This finding is also supported with the result of one-way ANOVA test, as given in the following table:

Table 3. ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Graduated employees	**Between Groups**	1341,737	2	670,868	,855	,432
	Within Groups	39251,256	50	785,025		
	Total	40592,992	52			
Researchers and scientists	**Between Groups**	1525,321	2	762,661	1,898	,160
	Within Groups	20090,384	50	401,808		
	Total	21615,705	52			

We can, therefore, reach a conclusion that the shares of graduated employees and researchers and scientists within the total number of employees do not significantly affect the innovation level in organizations.

7. Conclusion

Having in mind the importance of innovation capability to intellectual capital of organizations, the aim of this study was to analize the effect of the human capital to the efficiency of innovation efforts. For that purpose, in our research we tried to analyze the relationship between the share of employed workers with at least graduation degree and scientists and researchers, and the innovation capability of organizations from technology and knowledge intensive industries in Serbia. In order to determine innovation capability, we used patent applications, new services and products launched and research and development projects initiated; all of them as innovation capability variables. The analysis has shown that

the innovation capability of organizations is not significantly determined by the human capital variables used in this study. We can, therefore, conclude that the increased share of employees with at least graduation degree and scientists and researchers do not necessarily lead to the increase in innovation capability of organizations from technology and knowledge intensive industries.

Technology and knowledge intensive industries are characterized as highly innovative industries. Organizations from these branches operate in constantly changing environment, where the rate of radical innovations is above average. According to the results of this research, other elements of human capital can be attributed to the creation of added value in organizations that are reflected in innovativeness, and we suggest that they are not directly related to the formal education of employees, at least when technology and knowledge industries are concerned.

References

Adams, J.D. (1990). Fundamental stocks of knowledge and productivity growth. *J Polit Econ*., 98, 673–702.

Armstrong, M. (2001). A Handbook of Human Resource Management Practice. *Kogan Page*.

Bontis, N. Assesing Knowledge Assets: A Review of the Models Used to Measure Intellectual Capital. available at: www.business.mcmaster.ca/mktg/nbontis/ic/publications/BontisIJMR.pdf.

Czarnitzki, D., Hussinger, K., and Schneider, C. (2008). Commercializing academic research: The quality of faculty patenting. ZEW Discussion Paper No. 08-069. Centre for European Economic Research, Mannheim (Germany).

Davenport, T. (1999). Human Capital: What It Is and Why People Invest It. Jossey-Bass.

Edvinsson, L., and Malone, M.S. (1997). Intellectual Capital: Realizing your Company's True Value by Finding Its Hidden Roots. New York: Harper Business.

Escribano, A., Fosfuri, A., and Tribo J. (2006). Managing external knowledge flows: The moderating role of absorptive capacity. *Research Policy*, 38, 96-105.

Fijalkowska, J., Jaruga-Baranowska, M. (2008). Management and Communication of the Companies' Knowledge – Review of Approaches to Intellectual Capital Reporting, *General Accounting Theory – Evolution and Design for Efficiency*, edited by Ireneusz Gorowski, Warsaw, 247-264.

Griliches Z. (1984). R&D, Patents, and Productivity. Chicago: University of Chicago Press.

Herrera, L., Munoz-Doyague, M.F., and Nieto, M. (2010). Mobility of public researchers, scientific knowledge transfer, and the firm's innovation process. *Journal of Business Research 63*, 510–518.

IC Knowledge Center (2008). *Intellectual Capital Defined*

Kaplan, R., Norton, D. (1996). Translating Strategy into Action – The Balanced Scorecard, Harward Business School Press, Boston, Massachusetts

Krstić, B., Bonić, Lj. (2016). EIC: A New Tool for Intellectual Capital Performance Measurement, Praque Economic Papers, University of Economics, Praque, http://www.vse.cz/pep/586

Little, S., Quintas, P. and Ray, T. (2002). Managing Knowledge – An Essential Reader. The Open University in association with Sage Publications. London, Thousand Oaks, New Delhi.

Lev, B. (2001). Intangibles. Management. Measurement, and Reporting, The Brooklyn Institutions, Washington, D.C.

Mowery, D. C., and Oxley, J. E. (1995). Inward technology transfer and competitiveness: the

role of national innovation system. *Cambridge Journal of Economics*, 19, 67–93.
Stewart, T.A. (1997). Intellectual Capital – The New Wealth of Organizations, Doubleday Publishing, New York.
Todo, Y., Zhang, W., and Zhou, L. (2009). Knowledge spillovers from FDI in China: The role of educated labor in multinational enterprises. *Journal of Asian Economics No. 20*, 626–639.
Wellman, J. (2009). Organizational learning – How companies and institutions manage and apply knowledge, New York: Palgrave Macmillan.
Yanrong, W., Yu, L., and Kang, L. (2011). Evaluation on the Competitiveness of High-tech Entrepreneurial Enterprises. *Energy Procedia (*2010 International Conference on Energy, Environment and Development - ICEED2010) , 5, 684-689.
Zucker, L., Darby, M.R., and Brewer, M.B. (1998). Intellectual human capital and the birth of U.S. biotechnology enterprises. *Am Econ Rev No. 88(1),* 290–306. derekstockley.com.au/newsletters-05/018-human-capital.html.