

DETERMINATION OF HUMAN CAPITAL VALUE AT MACRO LEVEL

Zieduna Liepe¹, Algimantas Sakalas²

^{1,2}*Kaunas University of Technology, Lithuania*

crossref <http://dx.doi.org/10.5755/j01.em.18.2.4101>

Abstract

The productivity of the value creation process is determined not only by the continuous process of change, but also by the compliance of the factors involved in this process. Therefore, the evaluation of these factors is one of the most important economic challenges. Human Capital (HC) is one of the most important factors of value creation. Despite this, today a systemic methodology of the economic HC evaluation at macro level is missing. If the attempts of HC evaluation at enterprise level are found in the works of Mayo (2001), Baron & Armstrong (2007), Murray & Efendioglu (2007), Schwarz & Murphy (2008), AL-Ma'ani & Jaradat (2010), Scholz, Stein & Bechtel (2004), there are practically no works that would express the HC value in monetary terms at macro level. This paper presents a complex technique of determining HC value at macro level, identifying the four constituents of HC value: HC value base, HC value depreciation, HC value recovery and HC value alteration. The creation of informational data base and the calculation of the HC value allow determining the monetary expression of the HC value at macro level and accomplishing the comparative analysis of the HC value in the EU countries.

The type of the article: *Methodological and empirical study.*

Keywords: *Human capital (HC), Human capital value, Human capital evaluation.*

JEL Classification: *I21, M53, O32.*

1. Introduction

Relevance and the problem of the research

The formation and creation of HC require the substantial contributions of financial, material and time input, with the perspective of benefiting in short or in the long-term, which depends on internal and external environment conditions and factors.

With regard to the utility of the HC value for individual or economic productivity, there are distinguished such factors as qualification, education, wages, and formation costs arising through the formal and informal education. Therefore, HC should be evaluated by the indicator of the systemic assessment, which would allow calculating the HC value in monetary terms.

HC is growing and gaining experience in the process of working period, as well as in formal and informal training sessions, but its value occurs only during its utilization. HC as tangible capital is not a fixed capital, which is gained by an individual once and for all. It loses its value and depreciates. Therefore, in estimating the HC value it is very important to assess the impact of the HC value loss, recovery and alteration.

HC value at macro level is a value of knowledge, skills and abilities of all the employees, which is necessary to ensure the long-term value creation process. In this sense, the entire country's employed population covers the HC value. It is necessary to realize that the value is developed in a constantly changing environment, and the continuous knowledge development is a necessary condition of modern society. Knowledge depreciation cannot be ignored, and, therefore, cannot be measured solely by the basic education. There should be permanent, additional injections in order to update existing and acquire new knowledge. Knowledge retention and the development rates mainly are influenced by technology development pace. There is no clear dependence on

knowledge depreciation and time. Shorter or longer process of uniform knowledge depreciation is replaced by turbulent periods of new knowledge demand. The demand for knowledge determines the value of knowledge. Existing knowledge can become useless when the priorities of knowledge and their importance in the value creation process change. Therefore, the compensation of the HC value is important not only at the enterprise level but also at the whole economy level.

Theoretical background

The theoretical and practical research performed for the HC evaluation both at micro (Low, 2000; Sveiby, 2002; Bontis & Fitz-enz, 2002; Fitz-enz & Davidson, 2002; Flamholtz, Kannan-Narasimhan & Bullen, 2004; Wang & Spitzer, 2005; Wright, 2006; Scholz, 2007; Scholz, Stein & Muller, 2007; Fitz-enz, 2009) and macro level (Acemoglu, 2001; Noorbakhsh, Paloni & Youssef, 2001; Wei, 2003; Le, Gibson & Oxley, 2003; Scholz, Stein & Bechtel, 2004; Baier, Dwyer & Tamura, 2006; Kleynhans, 2006) allows stating that the HC value is related to many factors. The managerial aspect of the HC evaluation problem is researched quite widespread (Mayo, 2001; Baron & Armstrong, 2007; Murray & Efendioglu, 2007; Schwarz & Murphy, 2008; AL-Ma'ani & Jaradat, 2010) revealing the quantity of HC and education, its rate of utilization, the aspects of motivation and other factors at the enterprise level. However, the conception of economic HC evaluation is missing, especially at macro level. But usually it is related to the level of education, the value of the HC formation, its depreciation and recovery, the value of wages, indirectly expressing the consuming value of education and the impact of the environment on the HC value increase or decrease, which is expressed by the influence of organizational, social, technical and other factors.

Therefore, in accordance with the method of the HC evaluation at enterprise level (Scholz, Stein & Bechtel, 2004) this study distinguishes the following constituents, determining the monetary value of HC at macro level: HC value base, HC value depreciation, HC value recovery and HC value alteration due to organizational factors and motivation.

Purpose of the study is to present an integrated technique of the HC value determination at macro level and to verify it by the example of the EU countries.

In order to achieve the stated purpose the present study employs the methodology of the HC value determination, distinguishing four constituents of the HC value, presenting the logic of their calculation and verifying the application of this methodology in the context of the EU countries.

2. Method

For the determination of the HC value at macro level the following principles were implemented:

1. The market is affected by the specific labor market laws, supported by the assessment of employees' wages in the economy labor market. The actually paid wages cannot always guarantee the retention of the skilled workforce, so it is important to evaluate the difference between the actual and the required wages for the pursued objectives solution;
2. The informational database was obtained mainly from the Eurostat or national statistical data reports for costs estimation in the individual EU countries. In addition to the costs of employees' wages, the costs of staff training are relevant. They are treated as the investment in HC value. It must be recognized that such calculation, which is based just on accounting value of investments, has its drawbacks. Since the knowledge retention and its value are definitely affected by self-learning, personal skills and responsibility, they are underestimated in this study research work.

Human capital value calculation

Based on the presented argumentation, for the HC value estimation at macro level there has been adapted the formula of Saarbruecken, applied for the calculation of the HC value at the enterprise level (Scholz, Stein & Bechtel, 2004), distinguishing the four constituents of the HC value at macro level:

1. **HC value base**, which includes the wages of country's employees and social security contributions, with the adjustment of purchasing power parity level in the country;
2. **HC value depreciation** due to the actual aging of employees' knowledge;
3. **HC value recovery** is documented as an increase of knowledge because of human resources training and development;
4. **HC value alteration** evaluates the possible changes because of motivation, innovation and organizational level.

$$HC_v = HC_b - HC_d + HC_r + HC_a \quad (1)$$

where HC_b – means HC value base;
 HC_d – HC value depreciation;
 HC_r – HC value recovery;
 HC_a – HC value alteration.

It can be argued that a well-motivated team, which has and systematically maintains the relevant knowledge for the value creation, forms a high HC value.

Although the logic of the equation (1) corresponds with the logic of the HC value estimation at enterprise level, the calculation of the individual elements in the equation have significant differences that need to be detailed.

HC value base consists of employees' wages that reflect their skills and determining conditions for the market wage amount. Here are evaluated the social security contributions, as this indicator display the social security contributions mandatory included into the costs, which indirectly meets the wage: by the change of mandatory social insurance contributions, it changes the payments from the wage for learning, health and so on. Separate justification is required because for the evaluation of the HC value base there is used the value of HC wage plus social security contributions (further the wage) and not the indicator of the HC value creation costs. This is determined by the number of arguments:

- HC wage reflects the HC value recognized by the economy;
- The cost indicator reflects not only the costs required by economy, but also the costs reflecting the interests of the employees. Therefore, in the applied wage indicator there is assessed a recognized wage of employees;
- The works of many authors (Pascharopulos, 1995, Becker, Huselid & Ulrich, 2001; Kleynhans, 2006; Baron & Armstrong, 2007) reveal that between these two indicators is a quite clear linear relationship: as the level of education increases, the growth of the possibility of employment and wages increase.

Employees' wages and social insurance contributions can be calculated in different ways: by aggregating - the average wage per employee multiplied by the number of employees; detailing - calculating this ratio by education level of employees, occupation, number of employees working in certain industries and so on.

Particularity of calculation is determined by each country's existing level of government statistics. The statistics of individual country, as a rule, allow significantly increasing the imagery of calculations, interpretation options, but the need to ensure comparability between the countries is inseparable from the reduction of calculation particularity. In the statistical database of Eurostat there has been selected an indicator reflecting these evaluation purposes – wages for employees, including the employers' social contributions, in Euro.

According to the wage level among the countries, it is necessary to evaluate not only the nominal wage, but also the fact that in several countries even the purchasing power of the same currency is uneven. It is therefore necessary to evaluate these variations in the purchasing power of each country. Purchasing power parity calculated for consumption goods is provided by Eurostat statistics, and after appropriate adjustments can be used for wages' base harmonization in the EU countries. In the simplest form the consuming value parity includes relative price levels, which show the level of the same goods or services in the national currency of different countries.

Determination of *HC value depreciation* due to the real depreciation of employees' knowledge faces with a series of problems, in case of their solution in the modern era of the knowledge society there would emerge new insights of HC evaluation at macro level. Calculation of the depreciation time traditionally is based on the assumption of half-knowledge loss, as the period during which half of the available knowledge is out of date (Sakalas, 2008). Of course, depreciation depends on the characteristics of the sector where knowledge is applied. Depreciation time indicates how long the previously acquired knowledge is useful for value creation process without any additional update.

The second indicator influencing the loss of knowledge is an employee working life expectancy. Staff turnover among enterprises shorten this time, however, at macro level the working activity of employee is usually not less than 40 years (from 24 to 65 years). This means that there are integrated different cycles of one person's working life, lifetime: - employment period when it is satisfied with previously acquired knowledge; - qualification period, when the acquired knowledge is updated; - a continuous, on-demand renewal of knowledge, by learning independently.

For the economic HC value calculation there will be used the indices, which allow evaluating indirectly the levels of knowledge depreciation and knowledge recovery.

Knowledge depreciation rates indirectly are reflected by the innovation indices:

- Index of high-tech exports, as a percentage of the total export amount;
- Index of the number of patent per million capita;
- Index of expenses for information technology, as a percentage of GDP;
- Index of expenses for research and development, as a percentage of GDP.

Each index can vary from 0 to 5. Weighted average of three indices gives the average value, which is used for knowledge "depreciation" coefficient determination. The higher is the index, the more intense is the depreciation, and accordingly the higher is the depreciation rate. To determine the knowledge depreciation coefficient there is used the linear relationship (see Figure 1) which can be expressed by the equation (2).

$$C_{kd} = I_n \times 0,2 \quad (2)$$

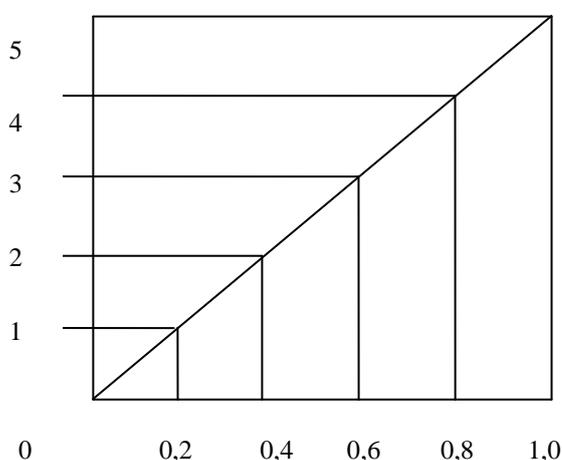


Figure 1. Moving from innovation index to knowledge depreciation rate

Accordingly, the HC value depreciation (see equation 3) will be calculated as follows:

$$HC_d = HC_v \times C_{kd} \quad (3)$$

where HC_v – means HC value;
 C_{kd} – knowledge depreciation coefficient.

Unfortunately, there is no more comprehensive research that would validate mathematical - statistical reliability of the determined index. Only a logical approval of the presented evaluation, based on the calculation results of the given technique, is presumptive.

HC value recovery can be realized in several ways:

- By replacing less qualified staff with highly skilled employees from other organizations or even countries (the conversion option is limited);
- By attracting newly trained specialists from vocational schools and higher education schools;
- By organizing the training of employees' and retraining;
- By self-raising qualification.

All methods are used in practice, but the main components to ensure the recovery of lost knowledge are graduates of various educational institutions, training and retraining. In the level of individual country in the statistical database of Eurostat, the indicators reflecting these factors allow calculating absolute values of expenses on education and training.

For the HC values recovery calculation at macro level there were selected two indicators (Eurostat, 2012):

- 1) General public expenditure on education (all education levels from 0 to 6) as a percentage of GDP;
- 2) Investment for training and retraining, as a percentage of GDP.

HC value alteration or increase is influenced by the variable rate of employees' motivation. Coefficient of motivation rate has to reflect the impact on the HC value because of the employees' desire and will to work, and influencing social interaction and communication structure. Quantitatively the rate of motivation is calculated in the base of motivation index, using the technique for knowledge depreciation calculation.

For the calculations there have been selected two indices:

- 1) Human development index (Human development report, 2012);
- 2) Index of life-long learning - participation in training, the age group of 15-64 years (Eurostat, 2012).

The selection of these indicators is based on the fact that assessments of individual countries by these indicators indirectly show the motivational level of each country's people to train, to seek for new knowledge, to learn in this way raising the country's wellbeing. The higher is motivation coefficient, the higher is the HC value. Therefore, a motivation coefficient is obtained by adding 1 to the estimated coefficient value.

The presented technique of the HC value determination reflects well the logic of the HC value loss, but its reliability is reduced by the informational gap. On the other hand, this shortcoming is inherent for statistics in all the countries concerned, and this increases the reliability of calculations carried out on uniform basis.

3. Results

The aggregate - total value of human capital is calculated according to the logic of the equation (1), considering that the HC value depreciation reduces the aggregate value of HC. The results are presented in the Table 1.

Table 1. The aggregate HC value

Gr.	Country	HC value base, millions €	HC value depreciation, millions €	HC value recovery, millions €	HC value alteration, millions €	Aggregate HC value, millions €
1	1.1. Netherlands	167.069	-142.008	40.895	32.978	98.933
	1.2. Luxembourg	-	-	-	-	-
	1.3. Sweden	89.587	-85.108	25.982	15.231	45.692
	1.4. Denmark	65.561	-62.283	21.323	12.301	36.902
2	2.1. Ireland	30.993	-24.794	10.717	6.766	23.682
	2.2. Finland	42.873	-38.586	12.462	7.537	24.287
	2.3. Belgium	82.168	-61.626	24.651	15.818	61.011
	2.4. Austria	74.511	-59.609	18.673	13.430	47.005
	2.5. United Kingdom	484.590	-363.442	128.904	100.021	350.072
	2.6. Cyprus	4.679	-2.339	1.648	997	4.984
	2.7. France	460.347	-391.295	125.922	58.492	253.466
	2.8. Germany	703.014	-597.562	145.140	100.237	350.829
3	3.1. Slovenia	11.669	-7.585	2.260	2.538	8.882
	3.2. Malta	1.546	-850	420	279	1.395
	3.3. Spain	252.826	-126.413	60.242	74.662	261.317
	3.4. Estonia	4.120	-1.854	923	957	4.146
	3.5. Portugal	53.680	-26.840	10.654	5.624	43.118
	3.6. Greece	42.076	-12.623	-	7.691	-
	3.7. Italy	303.610	-166.986	79.988	64.984	281.596
	3.8. Czech Republic	41.016	-26.660	7.406	6.528	28.290
4	4.1. Latvia	5.092	-1.528	1.118	702	5.385
	4.2. Slovakia	15.234	-5.332	3.162	1.960	15.024
	4.3. Poland	79.230	-31.692	20.823	10.254	78.615
	4.4. Hungary	23.822	-14.293	4.971	2.175	16.675
	4.5. Lithuania	7.060	-1.765	1.735	1.054	8.084
	4.6. Bulgaria	8.854	-2.214	1.889	853	9.383
	4.6. Romania	34.632	-8.658	5.397	3.137	34.508

Source: created by the authors

Explanation of performed calculations in the Table 1:

HC value depreciation is calculated by multiplying the HC value base in column 3, with the estimated coefficient of HC knowledge depreciation.

For example: HC value depreciation of Netherlands = $167.069 \times 0,85 = -142.008$ in millions of Euro.

HC value alteration due to the motivation level is calculated by multiplying the sum of the columns (3) + (4) + (5) with the estimated coefficient of motivation level.

For example: HC value alteration of Netherlands = $(167.069 - 142.008 + 40.895) = 32.978 \times 0,5$ in millions of Euro.

The calculation logic and the process for other countries are similar.

In the Figure 2 there are presented the aggregate HC values of the individual EU countries clearly indicate that the main factor influencing the level of country's HC is the country's size, which is reflected in both population and GDP.

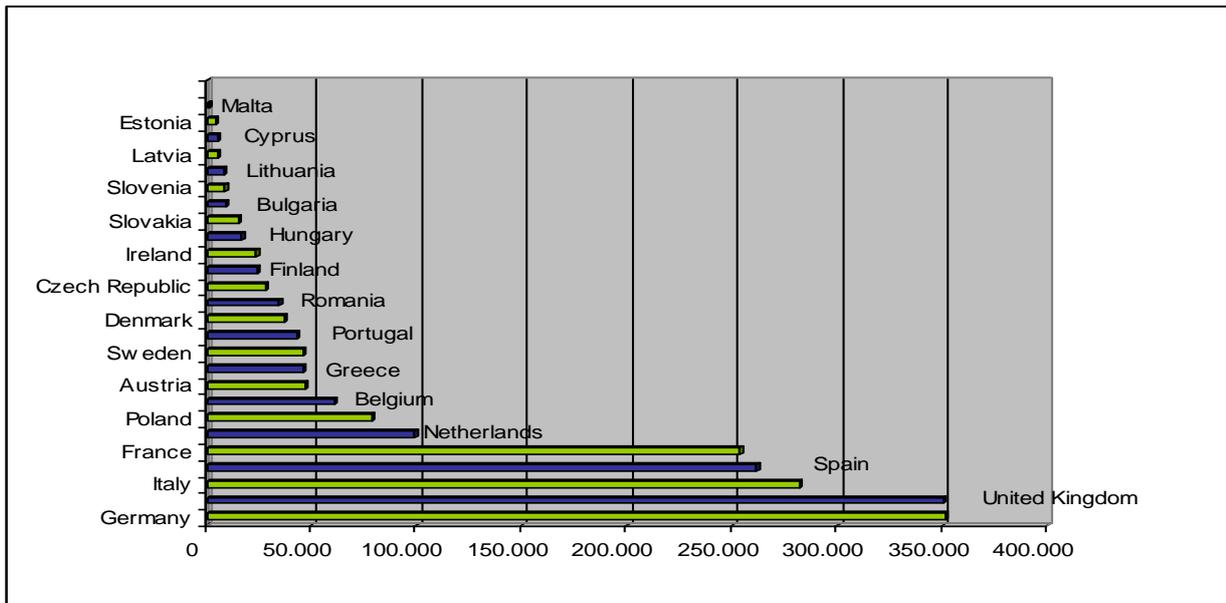


Figure 2. Aggregate HC value of the individual EU countries (millions / Euro)

Of course, there are other factors, but in the graphic image a high place takes Romania, which by the evaluation of the systemic HC value, is in the last place (see Table 1). Whereas according to the aggregate value of the HC, considering the number of employees, Romania is ahead of the countries with a smaller population.

The HC value calculated per employee is much more informative (see Fig. 3). Here it is clearly indicated that the size of the country is far from being the only factor that determines an employee’s average annual value.

The first group, where the HC value per employee is more than € 10.000, includes such countries as Netherlands, Sweden, Denmark, Ireland, Belgium, Austria, the United Kingdom, Cyprus, Spain and Italy. Except for the United Kingdom, these are not the biggest countries, but all are assigned to the high-tech development countries, laying strong efforts to lead in the European and world markets. On the other hand, it can be said that some countries are living beyond their means, because the wage rate is the basic of the HC value. This is Italy and especially Cyprus and Spain, which are in a deep economic crisis today.

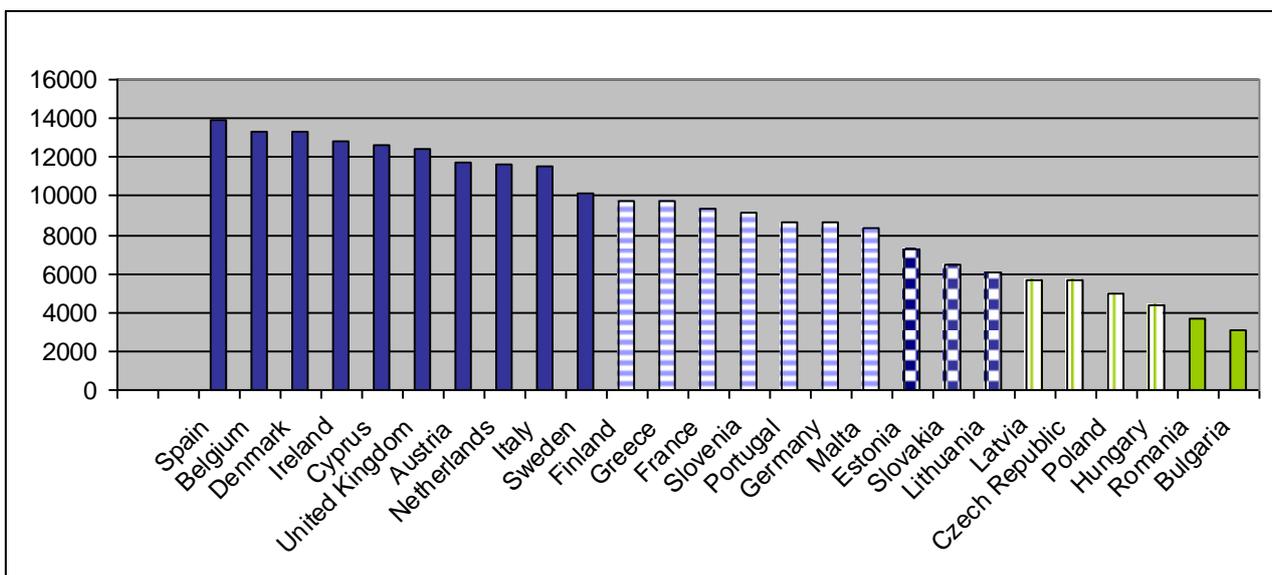


Figure 3. HC value per employee (Euro)

The second group between € 10.000 and € 8000 includes the countries - Finland, France, Germany, Slovenia, Malta, Portugal, and Greece. In this group there are countries that are making significant efforts to address the economic problems in the EU, in particular by showing a saving model. This is Germany, Finland and France. At the same time in this group there are located such countries as Portugal, Greece, which are on the verge of bankruptcy.

The third group is between € 8000 and € 6000 with such countries as Estonia, Slovakia and Lithuania. According to the HC value per employee all of these countries have only a very slight excess of € 6000 limit and would probably be appropriate to combine the groups 3 and 4.

The fourth group between € 6000 and € 4000 include the countries - Latvia, the Czech Republic, Poland, and Hungary. In this group, Latvia and the Czech Republic are particularly close to the third group of indicators.

And finally, in **the fifth group**, where the HC value per employee is less than € 4,000, there are located Bulgaria and Romania, therefore these countries are quite significantly behind based on their indicators.

The performed classification of the EU countries is logically based by the estimated aggregate HC value and emerge some deviations that are associated with the different methods of grouping and the differences that occur in the analysis of the final results. However, these differences are smaller than the commonalities, which indirectly confirm the applicability of the calculations.

4. Discussion

Determination of the HC value at macro level allows calculating the HC value in the monetary terms, introducing the technique of the HC value constituents' calculation, considering that the HC value depreciation reduces the aggregate HC value. The presented technique of the HC value determination at macro level evaluates the rate of real wages at country level, the rate of knowledge depreciation and recovery, the value gain due to the motivation and the level of organization providing a systemic approach for the problem solution.

Based on these principals there were estimated the aggregate HC value (in millions €) for the 25 EU countries (except Greece and Luxembourg, because of the lack of statistical data), considering that the HC value depreciation reduces the aggregate HC value. The research revealed that the main factor influencing the level of HC is the country's size, which is reflected both by population and GDP. A more explicit picture has appeared by the performed analysis of the results obtained by the estimation of the HC value per employee, where the EU countries were divided into the five groups, highlighting the general characteristics of each country's group in terms of their size, development and underdevelopment.

In the conditions of changing country's economy, the empirical research results may vary, depending on the economic, social, political, environmental conditions, but the results obtained in the study are significant in exploring the options of the HC value determination at economy, branch - macro level.

References

- Acemoglu, D. (2001). Human capital policies and the distribution of income: A framework for analysis and literature review. *Working Paper 01/03*, New Zealand Treasury, Wellington.
- AL-Ma'ani, A. I. & Jaradat, N. (2010). Impact of Human Capital on the Organization Performance. *Interdisciplinary Journal of Contemporary Research in Business*. 2 (4), 63-73.
- Baier, S., Dwyer, G. & Tamura, R. (2006). How important are capital and total factor productivity for economic growth? *Economic Inquiry*, 44(1), 23-50.
- Baron, A. & Armstrong, M. (2007). *Human capital management: achieving added value through people*. London: Kogan Page Limited.
- Becker, B. E., Huselid, M. A. & Ulrich, D. (2001). *The HR scorecard: Linking people, strategy, and performance*. Boston: Harvard Business School Press.

- Bontis, N. & Fitz-enz, J. (2002). Intellectual capital ROI: a causal map of human capital antecedents and consequents. *Journal of Intellectual Capital*, Vol. 3, No. 3, 223 – 247.
- Eurostat. *Europos komisijos „Eurostat“ informacija*. 2010. Retrieved March 11, 2012, from: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=mny_stk_mcp_a&lang=en
- Fitz-enz, J. (2009). *The ROI of Human Capital: Measuring the Economic Value of Employee Performance*. New York, Amacom.
- Fitz-enz, J., Davidson, B. (2002). *How to measure human resource management*. (3rd edition). New York: McGraw-Hill/Irwin.
- Flamholtz, E. G., Kannan-Narasimhan, R., Bullen, M.L.(2004). Human Resource Accounting today: Contributions, controversies and conclusions. *Journal of Human Resource Costing & Accounting*, 8 (2), 23-37.
- Human development report. *Žmogaus išsivystymo indekso ataskaitos informacija*. 2011. Retrieved August 8, 2012, from: http://hdr.undp.org/en/media/HDR_2010_EN_TechNotes_reprint.pdf.
- Kleynhans, E. P. J. (2006). The Role of Human Capital in the Competitive Platform of South African Industries. *SA Journal of Human Resource Management*, 4, 55-62.
- Le, T., Gibson, J., Oxle, L. (2003). Cost- and Income-based Measures of Human Capital. *Journal of Economic Surveys*. Volume 17, Issue 3, 271–307.
- Low, J. (2000). The Value Creation Index. *Journal of Intellectual Capital*, Vol. 1, No.3, 252-263.
- Mayo, A. (2001). *The human value of the enterprise. Valuing people as assets – monitoring, measuring, managing*. London: Nicholas Brealey Publishing.
- Murray, L. W. & Efendioglu, A. M. (2007). Valuing the investment in organizational training. *Industrial and Commercial training*, Vol. 39, No. 7, 372-379
- Noorbakhsh, F., Paloni, A., Youssef, A. (2001). Human capital and FDI inflows to developing countries: New empirical evidence. *World Development*, 29(9), 1593-1610.
- Sakalas, A. (2008). Human resources management as science and studies at KTU economics and management faculty. *Engineering economics = Inžinerinė ekonomika*. Kaunas University of Technology. Kaunas : Technologija. ISSN 1392-2785., no. 4 (59), p. 46-52.
- Schwarz, J. L. & Murphy, T. E. (2008). Human capital metrics: an approach to teaching using data and metrics to design and evaluate management practices. *Journal of management education*, Vol. 32, No. 2, 164-182.
- Scholz, Ch. (2007). Human Capital Management – More than just a Phrase. *German Journal of Human Resource Research*, Vol. 21, Issue 3.
- Scholz, Ch., Stein, V., Bechtel, R. (2004). *Human Capital Management*. Wege aus der Unverbindlichkeit Walters Kluwer Deutschland GmbH, Munchen. Unterschleisheim.
- Scholz, Ch., Stein, V., Muller, S. (2007). Monetary Human Capital Measurement: Empirical Evidence from the German DAX 30 Companies. *In Academy of Management Conference*, Philadelphia, USA.
- Sveiby, K. E. (2004). *Methods for Measuring Intangible Assets*. Retrieved October 24, 2011, from <http://www.sveiby.com/articles/IntangibleMethods.htm>.
- Pascharopoulos, G. (1995). *The profitability of investment in education: concepts and methods*. HCO.
- Wang, G. G. & Spitzer, D. R. (2005). Human Resource Development Measurement and Evaluation: Looking Back and Moving Forward. *Advances in Developing Human Resources*, Vol. 7, No. 1, 5-15.
- Wei, H. (2003). Measuring the stock of human capital for Australia. *Working paper*, Australian Bureau of Statistics, Canberra.
- Wright, S. (2006). *Tobin's q and Intangible Assets*. Retrieved July 8, 2010, from <http://www.ems.bbk.ac.uk/faculty/wright/pdf/TobinsQIntangibleAssets>.